FIRST AID TO THE INJURED

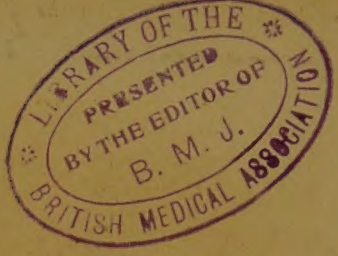
SIX AMBULANCE LECTURES

TRANSLATED FROM THE GERMAN

BY

H. R. H. PRINCESS CHRISTIAN

SMITH ELDER & Co



AMBULANCE LECTURES

FIRST AID TO THE INJURED

SIX AMBULANCE LECTURES

BY

DR. FRIEDRICH ESMARCH

PROFESSOR OF SURGERY AT THE UNIVERSITY OF KIEL, ETC.

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BY

H.R.H. PRINCESS CHRISTIAN

SEVENTH AND ENLARGED EDITION

WITH ADDITIONAL ILLUSTRATIONS

LONDON
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1907

TRANSLATOR'S PREFACE

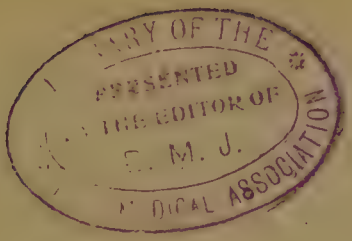
TO

THE SEVENTH EDITION.

A FRESH EDITION of my translation of Professor von Esmarch's Lectures on 'First Aid to the Injured' having become necessary, I have made some additions to it from the recent Edition published last March by Professor von Esmarch.

It is extremely gratifying to me to find that my little volume is still appreciated by the public and still found useful. The important and excellent work done by the St. John's Ambulance Association is spreading yearly more and more, and is always becoming more appreciated and valued.

CUMBERLAND LODGE:
October 1906.



TRANSLATOR'S PREFACE.

So MUCH INTEREST has been excited by the Ambulance Lectures delivered all over the country during the last few years that I feel I need make no apology for publishing this translation of Professor Esmarch's Lectures on the same subject: their excellence and their clearness will suffice to commend them to those interested in this work.

This translation is not in the least degree meant as a substitute for Dr. Shepherd's little handbook; but, having personally attended the Ladies' Classes of the Windsor Centre of the St. John's Ambulance Association, I—and probably others besides myself—felt the want of a more

detailed account of the work aimed at than was supplied by notes made at the time ; such a want Professor Esmarch's Lectures seem to supply.

Should any of my fellow-countrywomen who may read this little book be brought to see how each one of us, in her own immediate sphere, may render effectual aid to a suffering fellow-creature, then the object which I have had in view in translating these Lectures will have been attained.

The satisfaction of being able to render the needed aid to those in pain, and of possibly being the means of saving a valued life, should more than counterbalance the scruples that some might feel in entering on such a study.

CUMBERLAND LODGE:
August 1882.

PREFACE

TO

THE TWENTY-FIRST EDITION.

THE Handbook or Guide for 'Samaritan Schools' has up to the present moment numbered more than 91,000 copies, and has besides that been translated into twenty-seven other 'living languages.'[1] These facts, and many others besides, prove that the instruction in 'First Aid' has made great progress during recent years, and that the opposition to

[1] The Handbook has been translated twice into English, twice into French and Italian, twice into Dutch, twice into Flemish, Danish, Norwegian, Swedish, Icelandic, Finnish, Russian, Polish, Hungarian, Roumanian, Servian, twice into Spanish, also into Japanese, Croatian, Marathian, Bohemian, and Greek.

such instruction which it encountered at first in Germany is gradually dying out.

I have thoroughly revised my Lectures, and have made a number of improvements, and I hope that this little book will have increased its usefulness for purposes of instruction. In this, too, as in former editions, I have had the advantage of the co-operation of Dr. Kowalzig.

FRIEDRICH VON ESMARCH.

KIEL: *March* 1906.

PREFACE

TO

THE FIRST EDITION.

THE following Lectures, delivered during last winter in my so-called 'Samaritan School,' are published in the hope and with the trust that many of my colleagues may follow my example, and found similar schools; and because I think that for such a purpose a sort of handbook or guide is desirable.

To make the Lectures popular and attractive to those who attended them, I found that large models and diagrams were of the greatest use, and the 'Samaritan Society,' founded at Kiel on March 5, 1882, has made it one of its duties to

reproduce these diagrams. With these and the necessary apparatus for bandaging, &c., the Society will be able to afford substantial aid to Samaritan Schools in other places.

The Society hopes soon to be in a position to offer copies of my diagrams at a reduced charge.

We hope by these means to succeed in spreading this movement all over Germany.

ESMARCH.

KIEL: *March* 14, 1882.

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AMBULANCE LECTURES.

LECTURE I.

INTRODUCTION.

THOUGH I have invited you here to teach you how to render the first aid to the injured, I do not in the least aim at rendering a doctor's services unnecessary; on the contrary, I hope to convince you how important the immediate help of a doctor is in most cases. What I wish to do is to enable you to give the *right kind of aid* before the doctor arrives—without which, irreparable injury might be done, and perhaps even a valuable life be lost.

When I look back on my career as a surgeon, I can with truth say that many and many are the times I have deplored that so very few people know how to render the first aid to those who have

suddenly met with some injury. This specially applies to the field of battle: of the thousands who have flocked thither in their desire to help, so few have understood how to render aid.

But my remark equally applies to the circumstances of daily life, especially to large factories and other industrial establishments. How many there are every year who die a miserable death, and who might have been saved by prompt aid, had anyone been near who knew how to give it! Statistics have proved that in Germany alone 30,000 lives are lost yearly through accidents; but how many more than those accounted for suffer injury we do not know; their number must be enormous.[1]

It is a terrible position to stand beside some accident, to see the red blood pouring unceasingly from the wound, to see death every moment

[1] *N.B.*—In 1896 the number of accidents amongst German workmen amounted to 350,428. It may therefore be assumed with some certainty that on the average amongst the whole population of Germany 990,000 accidents occur every year (that is to say 2,700 daily), of which 85,500 are fatal. Further, it has been ascertained that the number of accidents increases year by year. In 1902, 834,566 persons received help from the Accident Insurance Companies: these persons were therefore unable to work or earn their livelihood for more than thirteen weeks.

approaching nearer and nearer, and not know how to avert the evil.

The desire to help a fellow-creature when injured exists in most of us, but people shrink from giving aid because they do not know how to do so, and are afraid of doing more harm than good.

It therefore fills me with gratification to see so many of you here to-day in answer to my appeal, anxious to learn what should be done to render aid in cases of injury.

You may perhaps know that in forming these classes, I am following the example of the English order of St. John of Jerusalem, which since 1877 has established in England the same kind of schools or classes under the direction of the best surgeons. That already more than 500,000 persons of both sexes have attended these classes all over that country testifies to the infinite assistance which they have already afforded. In England these classes are called 'Ambulance Classes,' but as a literal translation of this name would be meaningless here, I have preferred calling them 'Samaritan Schools,' for reasons which I need not explain.

As a member of the Red Cross Society, I have originated this school. There are many among you who have already done Ambulance service in time of war, and many who, in the event of another war, would be ready to do so again. Accordingly in these lectures I shall constantly have to refer to the battle-field. I hope and trust that, under the sign of the Red Cross, similar Samaritan Schools may arise all over Germany, and prove of much service in times alike of peace and war.

Before I commence to explain to you how you can give judicious help in injuries and sudden accidents, it is necessary that I should give a short account of the structure and functions of the human body, though no doubt many of you are not ignorant of this, as such instruction is now often given in schools; but I trust that my lady listeners will not take fright at the appearance of a skeleton and other parts of the human frame, the sight of which I regret I cannot spare them.

I shall show you in this lecture how the bones form the framework of the whole body; how all movement is produced by the muscles; how all sensations, all emotions and movements are dependent on the nervous system; how the blood is

diffused all over the body by the action of the heart ; how by means of the breathing, the oxygen, so necessary to life, is constantly being conveyed to the blood ; and how the food which is taken is digested in the stomach and intestines, and ultimately conveyed to the tissues of the body.

Let us commence with the bones.

The Bones.

These form the framework (skeleton), the firm foundation of the body. They are hard, firm, durable ; they carry and support the softer and more delicate parts of the body ; they guard and surround the chief organs of life (brain, spinal marrow, heart, lungs, intestines) ; they make movement possible by means of the joints and muscles.

The skeleton consists of the following parts :—

The Head.

Twenty bones form the skull and face, all tightly knit together, with the exception of the lower jaw, which is movable. The flat bones of the skull, united by jagged sutures, surround the cavity of the skull, in which lies safely protected the chief organ of life—the brain.

The face contains the organs of special sense—eyes (sight), ears (hearing), nose (smelling), tongue (taste).

The Spinal Column

carries the trunk, head, and arms, and contains and protects the spinal marrow (the continuation of the brain). It is composed of twenty-four vertebræ, having interposed between them elastic pads of cartilage which enable the body to bend and turn, and also act as buffers to ward off jars in jumping or falling. We have seven vertebræ of the neck (cervical), twelve of the chest (dorsal), and five of the loins (lumbar). The lower extremity of the spinal column consists of the flat sacrum or rump bone, and a small tail-like bone, the coccyx.

The Chest (*Thorax*)

is composed of twelve ribs on either side (seven true and five false), which are loosely attached behind to the spine; and of the breast-bone (sternum), with which the ribs are connected by means of elastic cartilages. The lower edge of the mass of cartilage connecting the lower ribs on either side with the breast-bone is called the

FIG. 1.—Human Skeleton. Upon the left side of the body the ligaments have been left in place; upon the right side they have been removed. The bones are shown black for the sake of distinction.

arch of the ribs, and between the sides of the arch is a piece of cartilage shaped like a short sword, forming a continuation of the breast-bone (ensiform cartilage). In the cavity of the chest are contained the most important organs of circulation and respiration—the heart and lungs; at its base the cavity of the chest is separated from that of the abdomen by a muscular fleshy partition called the diaphragm, in shape like a flattened bell, the contraction of which increases the space within the thorax by the flattening of its dome (inspiration).

The Pelvis

is a wide, strong, bony cavity, formed by three large bones—the two haunch-bones (ilia) and the sacrum or rump-bone. It forms a firm support for the trunk and intestines, and connects the body with the lower limbs by means of very strong but very flexible joints.

The Limbs.

Of these there are two upper and two lower—the arms and the legs. Each upper limb is composed of the collar-bone or clavicle, the scapula

or blade-bone, the bone of the upper arm (the humerus), the two bones of the forearm (the radius and ulna) ; of the hand, which again is made up of twenty-seven small bones, eight for the wrist (carpus), five for the hands (metacarpus), and fourteen for the fingers. The upper limbs admit of freer movement than the lower ones, as they are jointed to the shoulder-blade, which is very movable.

Each lower limb consists of the thigh-bone, knee-cap, two leg-bones (the tibia and fibula), and the foot ; this latter is again made up of twenty-six small bones, of which seven form the tarsus (heel and instep), five the middle of the foot (metatarsus), and fourteen the toes. The bones are connected with one another by firm bands (the ligaments), which, however, permit of free movement in certain directions.

The Joints.

The joint-ends of the bones are covered with smooth whitish cartilage, so that their surfaces rub smoothly against each other. They are hermetically enclosed in a soft flexible sac or

membrane, the capsule of the joint, which secretes an oily fluid (synovial fluid) as lubricant. The movements of the bones in the joints are effected by

The Muscles.

These are bundles of reddish fibres, which have the power of contraction—that is to say, they become thicker and shorter and bring together the bones to which their ends are attached (for example, the biceps muscle of the upper arm). When the points of attachment of a muscle to the bones on which it acts lie far apart, many end in unyielding sinews (tendons)—a wonderful piece of mechanism, not unlike the lever, bands and wheels in an elaborate machine. An example of such muscles we have in those of the forearm, whose long unyielding tendons stretch from above the wrist right down to the ends of the fingers. The great difference is that they do not wear out through constant use, but on the contrary become stronger and stronger, as in the arms of blacksmiths, gymnasts, &c.

The contraction of the muscles takes place under the influence of the will—an influence

which is transmitted to them by the nerves which run alongside the veins between the muscles and send branches into every single muscular fibre. But there are also muscles, such as the heart, and the muscular portions of the stomach, and intestines, which contract independently of the will, and without consciousness on our part of their action.

The Nervous System

is a most complicated, wonderful, and mysterious arrangement, which is ever being studied and investigated by innumerable physicians and men of science, because by it one really first becomes acquainted with many of the conditions of life. The principal parts of the nervous system are the brain, the spinal cord, and the nerves, which proceed from them.

The Brain

is enclosed in the cavity of the skull, and consists of a greyish-white soft smooth mass formed of nerve tissue. On its surface are seen many tortuous convolutions with furrows between; its structure is most complicated. It consists of a cerebrum,

or large brain, which fills up the greater part of the cavity of the skull, and which is divided into two halves by a longitudinal cleft, and of the cerebellum, or lesser brain, which lies at the back of the head behind the ears. The brain shows a distinct division, or line of demarcation, between the white internal mass and the grey cortex or rind which forms the convolutions and furrows. The latter is the seat of the intellect, the will and sensation. All the functions of life are under its direct control. Hence the striking difference in its size in man and the lower animals according to their intelligence—in human beings it is $\frac{1}{40}$ of the weight of the body, in the elephant $\frac{1}{500}$, and in the whale $\frac{1}{3000}$.

The brain sends nerves to the organs of the special senses; these pass out to the face through holes in the skull (the nerves of smell, hearing, seeing, taste). The principal continuation of the brain is

The Spinal Marrow,

a long cylindrical whitish-grey cord, composed of nerve cells and nerve fibres. It lies in the vertebral canal, in the middle of the spinal

column, and gives off sideways through perforations in the vertebræ thirty-one pairs of nerves,

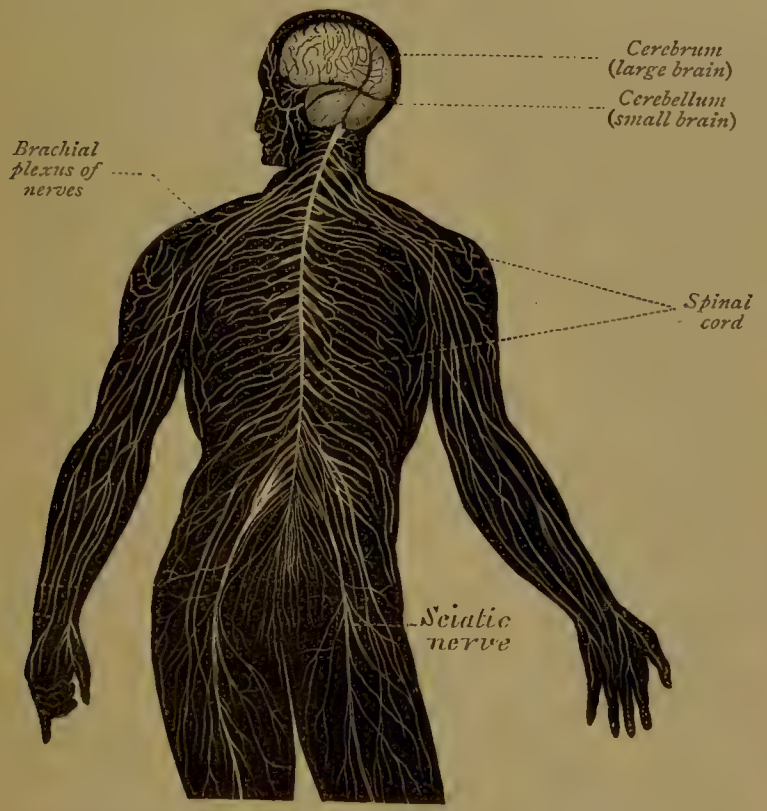

FIG. 2.—View of the Nervous System of Man, showing the Nerve Centre (Brain and Spinal Cord) giving off nerves to supply the whole of the body.

each having two roots, which go to all parts of the body and preside over movement (anterior roots) and sensation (posterior roots).

The Nerves

are white cords, attaining, in the case of the sciatic nerve, the thickness of an ordinary pencil, which branch off into ever smaller and smaller filaments (the minutest of which can only be seen through a microscope). They go to all parts of the body, and are the medium of sensation—of movement (muscular), of secretion (in the glands), and of nutrition. They originate in the brain. The whole nervous system may be compared to a network of telegraph wires, with the brain as the central office, whilst the sub-offices and the trunk lines are found in the spinal marrow, the nerves representing the single wires. The messages come and the orders go almost with lightning rapidity (reflex action).

After injuries to the brain or effusion of blood upon it, there result insensibility, loss of movement, of feeling, of speech. Injuries to the spinal marrow cause paralysis of the lower half of the body. Where a nerve has been severed, as by cutting, shooting, or stabbing, loss of feeling (or sensation) or of movement follows. Injuries of the upper part of the spinal cord (the medulla) prove immediately fatal.

The Sympathetic Nervous System.

Besides the nervous system already described there is yet another, which is not subservient to the will, but entirely independent, and which controls the bodily functions necessary for life—circulation, respiration, secretion, and excretion. We call it the sympathetic or ganglionic system of nerves. It consists of two long, grey cords which lie on either side of the spinal column and have numerous knotty swellings or ganglia, and send out numberless delicate filaments, especially to the organs which are not controlled by the will (the heart, lungs, stomach, intestines). In innumerable ways it is intimately connected with the voluntary system, so much so that it is impossible to draw any hard and fast line between their respective spheres of action.

It continues to act regularly even during sleep or insensibility (paralysis, fracture of the skull, alcoholic poisoning).

The Circulation.

The red warm life-giving fluid which we call the blood is constantly being driven with great

rapidity through a much ramified network of tubes or blood-vessels which traverse the whole body. The organ which sets the mass of the blood in motion is

The Heart.

The heart is not the seat of the feelings and emotions, but a most skilfully devised muscular pumping machine. It is a hollow muscular organ, containing valves which allow the blood to flow in one direction, but prevent, by their closure, any backward flow. Its valvular mechanism may be compared roughly to that of the common rubber syringe with central bulb, or to folding-doors or floodgates. It contracts and dilates again in a regular and rhythmical manner. If this movement is arrested, and the heart stands still, death soon follows. The heart is situated between the two lungs in the cavity of the chest, and is surrounded by the pericardium. Its shape is conical, with its point directed downwards to the left. Its size is about that of one's fist. It is divided into two halves by a muscular partition: the left, the stronger of the two, supplies the body with blood, the right drives the blood into the lungs. From

the left side of the heart a tube about the thickness of one's thumb (the aorta) conducts the blood

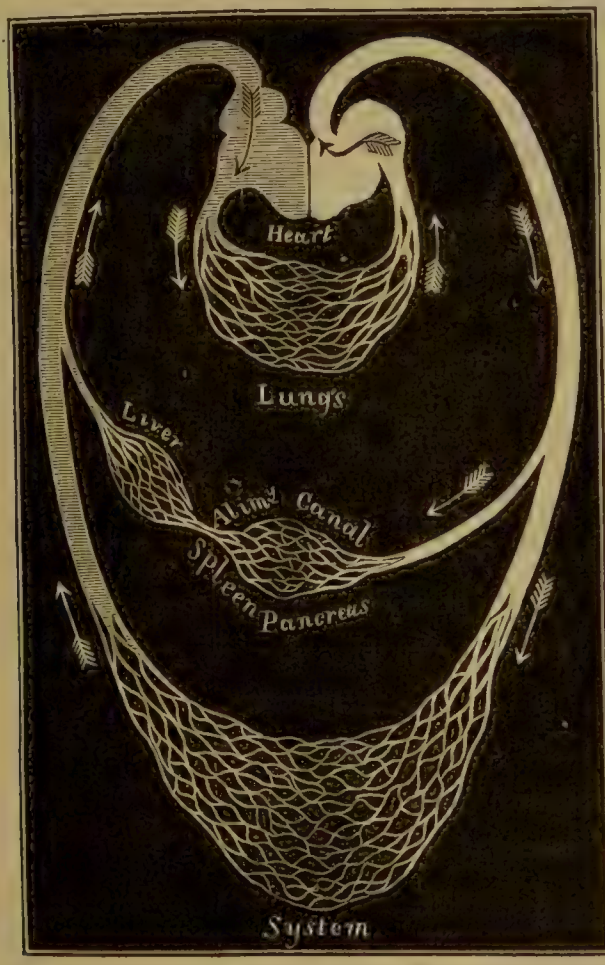

FIG. 3.—Diagram of the Circulation in Man (and other Mammals).

stream throughout the body, dividing as it goes into smaller and smaller elastic tubes, the arteries,

which are named after the parts of the body to which they go (cerebral, cervical, brachial, &c.), and which they supply with blood. The regular beats of the blood-wave we call the pulse, which is to be felt at different parts of the body—not only at the wrist, but in the upper arm, the neck, the head, the temples, &c.

The arteries break up into smaller and smaller branches, and at last form a thick network of the very finest tubes, varying from the thickness of a hair down to $\frac{1}{5000}$ of an inch in diameter, these latter, of course, being only visible through the microscope. These very fine tubes are called capillaries, from the Latin word for a hair. They spread everywhere, and give the rosy tint to the skin. If you press with your finger anywhere on the skin, a white spot appears, which by degrees recovers its colour after the pressure is removed; the pressure drives the blood out of the finest blood-vessels, and it slowly returns to them. Blushing is caused by the sudden rush of blood into these small vessels. When one turns pale through mental emotion the blood is driven out of them into the deeper vessels. Pricks or cuts in the skin at any point open very fine blood-

vessels and cause the blood to flow as from a sponge. These minutest vessels reunite at their finest division into larger branches, and these into still larger trunks, through which the blood returns to the heart. We call these

The Veins.

These are the blue lines which are seen under the skin when the arm is allowed to hang down, and which almost disappear when it is raised up high. If a vein is pricked, dark-purple blood wells out in a continuous flow; if an artery is wounded, bright-red blood spirts out in a jet—*i.e.* with great force and rapidity and in irregular jerks, but with pauses in the flow, because it is driven out by the pumping action of the heart. What causes the difference in the colour of the blood proceeding from these two kinds of blood-vessels?

The Blood

is composed of a clear yellowish fluid (serum) and little red flat discs (blood corpuscles), each of which measures from $\frac{1}{3000}$ to $\frac{1}{4000}$ of an inch in diameter. The whole mass of the blood of an adult human being contains about twenty-five

thousand millions of these. The blood is necessary for the nourishment and warmth of the body; and the red corpuscles play the chief part in these processes. The dark-red blood contains more carbonic acid, the bright-red more oxygen; so that the bright-red blood on its passage through the smallest vessels must have given off oxygen and taken up carbonic acid. Indeed, there take place in the capillaries chemical changes which may be compared to combustion, in which also oxygen is consumed and carbonic acid produced, and it is by these changes that the body is warmed and nourished.

When the used-up dark-red blood returns through the blood-vessels to the heart, it must again be purified—*i.e.* it must get rid of the carbonic acid, and again take in oxygen, by which means it again becomes bright red. This change is effected in the so-called lesser circulation, that of the lungs, by means of the breathing.

The Lungs

are two soft spongy bags, saturated with blood; they lie one on each side of the heart, hermetically enclosed in the cavity of the chest (thorax), and

surrounded by the pleura. Air is drawn into and forced out of them by the rhythmical bellows movement of the chest wall and the contraction of the diaphragm. The air enters by the windpipe ; this

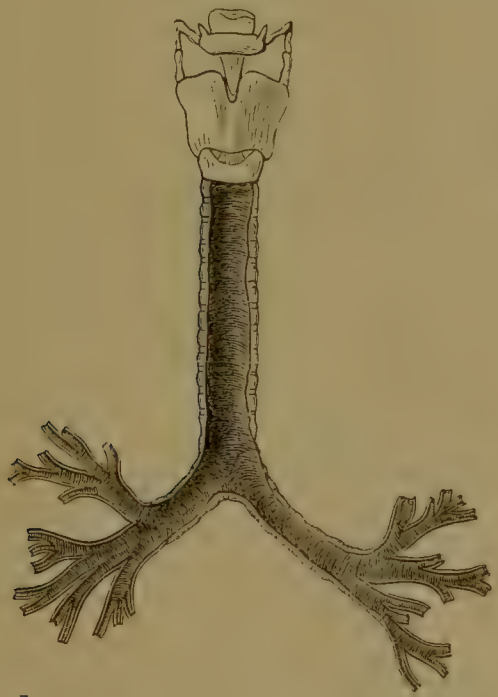

FIG. 4.—The Larynx (Opening of the Air-tube), Trachea, and Bronchi (Air tubes). Below the larynx the front of the tube has been removed.

breaks up like a tree into smaller and smaller branches (fig. 4), which finally end in innumerable minute air-cells (fig. 5), over which is spread a network of small blood-vessels which are connected with the right side of the heart.

It is from the air which passes into these small cells that the blood-vessels take in their oxygen, and into it that they give out the carbonic acid which is found in the expired air.

The blood, now once again become bright red, is carried back again to the left side of the heart, to be transmitted afresh to all parts of the body.

FIG. 5.—*a a*, Two small groups of Air-cells. *c*, The ultimate Bronchial Tubes communicating with *b*, the Air-cells. Magnified (Kölliker).

The oxygen is the life-giving and nourishing element of the air; the carbonic acid is the product of combustion—the waste material, the ashes: it is of no further use in nutrition, and must be got rid of. If this exhalation is stopped, as in spasm of

the windpipe and in croup, death soon follows ; a like result follows if oxygen is not inhaled.

Besides the carbonic acid there are other products of tissue-change which have to be got rid of, particularly

Water and Urea.

The latter contains the used-up nitrogenous material of the tissues, and is got rid of through the

Kidneys.

These are two smooth, bean-shaped bodies, which are situated in the cavity of the abdomen and on each side of the spinal column. The urine is transmitted from them into the bladder through two long tubes.

But equally important for the excretion of worn-out products is the

Skin.

This covers the whole of the body, and first of all, as a bad conductor of heat, helps to keep up its temperature, to which the layer of fat under it also conduces not a little. In the skin are imbedded numerous sweat-glands (about three millions), which

excrete in twenty-four hours nearly as much water as the kidneys (over thirty-five ounces)—about 1,000 gr. (= 1 klgr.) in twenty-four hours—partly through perspiration and partly through imperceptible evaporation.

This water also contains no inconsiderable quantity of worn-out tissue products which act as poisons if retained.

The Food

serves to make good to the body the worn-out elements which have been got rid of. For this purpose it must pass through a long thin muscular tube of different diameters—the alimentary canal, in which the various nutrient materials are taken from the food and conveyed into the blood. The food is taken in by the mouth, crushed in it by the teeth, mixed with saliva, and then passes through the gullet and œsophagus, which lies behind the windpipe, into the stomach.

The Stomach

is a large muscular sac, whose walls secrete an acid juice (the gastric juice), which, by means of constant movement, is intimately mixed with the food.

This mass, through the constant contraction of the stomach, is pushed into the intestines, and by continuous movement is forced along the whole alimentary canal. In this way the lymphatics which are situate in the walls of the intestines take up the nutrient elements of the food, and convey them in the form of chyle to the blood. This elaboration of the mass of the food is promoted by means of certain juices helpful to digestion: amongst others, the bile, which is formed by the liver, situated on the right side of the body under the false ribs; and the pancreatic juice, formed in a gland (the pancreas—the sweetbread of the lower animals) which is situate behind the stomach. What remains of the food after all the nutrient elements have been extracted passes out of the body.

LECTURE II.

INJURIES.

Contusions (Bruises).

CONTUSIONS are injuries caused by falls or blows which have resulted in internal lacerations, particularly of the smallest blood-vessels.

The results are: effusion of blood under the skin, almost immediate painful swelling and discoloration of the injured part (first, blue-red ; later brown-green, &c.) due to the colouring matter of the blood. For trifling injuries of this kind the application of cloths wrung out in cold water, or the pressure of some cold substance, is very useful, as it stops the further effusion of blood. If, besides the outer skin, important internal organs (brain, spine, lungs, liver, intestines) have suffered, bad symptoms at once become apparent. In concussion of the brain you have fainting, insensibility, vomiting. In injuries to lungs you have blood-

spitting; in those to the abdomen, violent pain, sickness, great pallor, fainting, and sometimes sudden death. The liver, spleen, or bowel may be so injured that blood or the contents of the bowel may be effused into the cavity of the abdomen. In such cases death results very quickly.

What can a non-professional person do in such circumstances?

1. Send at once for the doctor.
2. Loosen all tight articles of clothing.
3. Place the injured person in a comfortable position—with his head low if he look pale or be faint.
4. Sprinkle him with cold water.
5. If the doctor should live at a distance and cannot be got, then carefully transport the patient to him.

Wounds.

These are injuries in which the skin has been severed. They are of various kinds—incised, punctured, contused, lacerated, gunshot, &c.

The danger of a wound depends on its depth and size, and, above all, on the importance of the deeper parts involved (veins, arteries, nerves, bones,

lungs, heart, brain, intestines, &c.). Punctured wounds and gunshot wounds are generally far more dangerous than from the size of the wound they may appear, because deep-lying important parts are so often injured by the point causing the wound, or by the bullet, and also because portions of a foreign body may have remained in the wound (bits of sword-blade, bullet, bone-splinters, pieces of the clothes).

In injuries caused by machines or by heavy guns, the internal parts injured are generally so crushed and lacerated that death speedily follows, or if it is a limb which has been injured, immediate amputation is generally necessary.

How do wounds heal? In two ways.

I. Quickly, by primary union (union by first intention) without suppuration, and leaving only a very fine scar. This mode of healing should always be tried for, but can be got only under the following conditions:—

1. When the sides of the wound can be accurately brought together.

2. When the sides of the wound are not displaced by bleeding or exudation of matter.

3. When the wound is left quiet and protected from outward injury.

4. When the wound is kept perfectly free from impurity.

II. The second mode of healing takes place slowly, with suppuration, and the formation of granulations, and leaves a large red scar.

This result occurs when the more favourable conditions are absent :—

1. When so much skin has been destroyed that the edges of the wound cannot be brought together—as in wounds caused by shells, in scalp wounds, &c. ; or when the edges of the wound are so lacerated and bruised that life is destroyed in them.

2. When the edges of the wound are separated by blood or exudation of matter.

FIG. 6 *a*. FIG. 6 *b*.

The Healing of a Wound.

By primary union. By granulation.

3. When the injured parts have been disturbed (the leg, by standing or walking ; the hand or the

arm, by working; or if the wounded person has been badly transported, which in times of war is often not to be prevented).

4. When the wound has been contaminated and has not been properly cleaned and disinfected. Want of cleanliness leads, even in the smallest wounds, to inflammation and the formation of matter (suppuration).

Matter, however, keeps the wounded surfaces apart and prevents their rapid (primary) union. When the wound begins to heal, granulations form, which are often called 'proud flesh.' These granulations by degrees, and with constant suppuration, fill up the wound, and are finally covered by a large scar, which remains red for a long time.

Suppuration and inflammation open the door to other dangerous surgical ailments, of which many people die after wounds and operations, especially when the sufferers are collected together in large numbers, as is the case in field hospitals in time of war.

Amongst these dangers are traumatic fever (wound fever), prolonged inflammation and suppuration, erysipelas, hospital gangrene, pyæmia, septicæmia, &c. Modern surgery has made

wonderful progress in the treatment of wounds, chiefly because a more accurate knowledge of the causes of suppuration and inflammation has taught us how to prevent these processes and how to guard against many of the dangers to which they give rise.

Before I can answer the question as to how a non-professional person may render aid in cases of wounds I must endeavour briefly to explain to you

How a surgeon treats wounds.

In all cases he naturally endeavours to bring about that mode of healing which was first described—primary union without the formation of matter.

1. In order to obtain that result the surgeon before he touches the wound washes his own hands thoroughly with soap and water, to which is added some antiseptic solution, besides completely disinfecting all instruments, &c.; he then carefully washes and cleanses the wound. He arrests any hæmorrhage there may be by tying any arteries which may have been severed. Strong sewing

silk, or carbolised catgut prepared for the purpose, is used in such cases.

2. He then endeavours to retain the edges of the wound accurately together either by stitches or by a bandage (*not* by means of sticking plaister: this, like most salves and plaisters, belongs to the surgery of the middle ages). In cases of small finger cuts it is permissible to use court plaister.

3. The injured part must be left perfectly quiet till the process of healing is complete. This is provided for by a carefully-applied bandage, which is generally allowed to remain on till the wound is pretty well healed; formerly the bandage was renewed every day, or more than once a day. Even after the bandage has been taken off, the injured limb must be moved as little as possible, lest the wound open afresh and matter be thus caused to form in it.

4. But the most important thing in the treatment of wounds is the antiseptic means of cleaning them. This should beladopted even in the case of the smallest wound, for it is only by this means that we can prevent suppuration, and so bring about primary union.

5. The antiseptic treatment consists partly in

the practice of the most minute and scrupulous and almost pedantic cleanliness, and partly in the adoption of certain measures which prevent putrefaction by destroying those very minute organisms (germs and bacteria) which are believed to play the chief part in the production of putrefaction.

How terribly dangerous these sources of putrefaction, which exist in all filth and in all putrid and decomposing matter, are to the human organism when they get into the blood, may be gathered from the accounts which so often appear in the newspapers of blood-poisoning from the most trifling wound. You read of someone having pricked his finger or hand with a pin or a steel pen, and of having died in a few days ; or of having been obliged to have his arm amputated because blood-poisoning had set in. In cases like these you may be sure that some dirt has got into the little wound, either with the pin at the time of the accident, or later by touching some dirty object.

How easily surgeons may be poisoned by such means, and often lose their health or life, is well known.

Among those substances which we call antiseptics or disinfectants are carbolic acid, salicylic

acid, boracic acid, thymol, chloride of zinc, iodoform, naphthalin. With these we clean the wounds and surrounding parts, our fingers and instruments; and in them we dip the different materials, lint, wadding, jute, gauze, &c., which we use in dressing the wound. As, however, all these substances are more or less poisonous and may therefore be more harmful to the patient than beneficial to the wound, their use has been very largely given up of late years in the treatment of non-contaminated wounds, and the entrance of bacteria ('germs') into the latter has been prevented by the complete destruction of all micro-organisms which may have attached themselves to any article which is to be brought into contact with the wound (sterilisation). Instruments are 'sterilised' in boiling water, dressings in jets of steam; the hands, whose sterilisation is the most difficult of all, are repeatedly washed with soap and disinfectant, and scrubbed with a nail brush, special care being bestowed on the folds under the nails; occasionally rubber gloves are worn by the surgeon. This so-called 'aseptic' method in surgery has been strikingly successful in its results.

Now that I have shown you with what care and precaution we surgeons try to ward off all noxious influences from a fresh wound, you will readily understand my answering the question, 'How is a non-professional person to render aid to the wounded?' by saying, He must before all things adopt that great principle which surgeons consider as the most important—'only do no harm'—that is to say, in the present case, introduce no harmful matter into the wound.

How dangerous any impurity is to a wound I have already explained to you. No lint or sticking-plaister or sponges which have been already used, or soiled linen, should be brought in contact with it, nor should wounds be touched with dirty fingers.

Every finger, even should it appear to the eye spotlessly clean, is from a surgical point of view dirty unless it has just undergone a thorough washing and scrubbing with hot water, soap, and some disinfectant solution. Even after this one cannot be sure that the finger is free from germs which might be harmful to a wound. It is therefore of the utmost importance to finger the wound

as little as possible. Dipping the hands in a disinfectant solution, however strong, is of little or no use unless preceded by a thorough cleansing such as has been described.

Should the wound be free from gross impurities, it is better to avoid all washing, handling and unnecessary examination, and to cover it simply with a clean, dry dressing with a view to preventing the entrance of further noxious matter of any kind. For this purpose a clean, recently washed handkerchief, opened out and folded so that the inner untouched part is applied to the wound, will answer admirably.

If any dirt (sand, earth, or mud) has entered it, the wound and the surrounding parts ought to be carefully washed or rinsed, but only with clean water and clean linen (pocket-handkerchief, towel, napkin, &c.). Quite clean well, spring, or tap water may be used, but water which has just been boiled is safer, as poisonous germs are destroyed by boiling. If the water cannot be boiled it is best to mix some disinfectant with it, and I would venture to suggest that in every house there should be kept a bottle of some antiseptic solution

(carbolic acid, salicylic acid, boracic acid), which may readily be got from any chemist.[1]

If a compress of clean linen soaked in an antiseptic fluid is laid on a wound, till the arrival of the doctor or surgeon, one is quite sure at any rate of having done no harm.

Should the wound, however, be covered with a layer of clotted blood, it should on no account be touched or 'washed off,' as that would probably cause the hæmorrhage to begin afresh. Also, should the wound be much covered with dirt, it is safest not to try to wash it or cleanse it—in fact, not to interfere with it till the arrival of the surgeon. It would suffice to cover the wound with a clean dry bandage to prevent further harm.

If no surgeon is near at hand, and the wounded person has to be transported to him, it then becomes necessary to fasten this provisional dressing on to the wound by a handkerchief or scarf, and at the same time to support the wounded limb well. How to do this I will show you later, when we discuss the subject of bandaging; I will also later

[1] Strong carbolic acid, it must be noted, is a dangerous thing to have lying about a house; it is a potent poison.

on explain to you what should be done in cases of violent bleeding.

In time of war every soldier carries with him a little packet of dressing, by means of which he can bind up his own wound or that of his comrade when no surgeon is at hand. Many attempts have been made to render these 'bandage packets' as compact and serviceable as possible for use in ordinary civil life. They are thoroughly sterilised, and generally so arranged that the dressing can be applied to the wound without coming in contact with the hand of the person giving first aid. If properly packed the dressing will remain sterile for an indefinite period. As a great many different kinds of bandaging can be done by a three-cornered handkerchief, and as such a handkerchief can be got almost anywhere, or improvised out of an ordinary pocket-handkerchief, you shall be shown how to use it when I come to the subject of bandaging. I wish to observe beforehand that dressings are generally used for the following purposes:—

1. As a *protection* against external agencies, such as dirt, dust, the heat of the sun, insects, &c.

2. To cause *pressure* (to press the sides of a

wound together; to prevent and stop hæmorrhage, &c.).

3. To give *rest* and *support* (to support the injured parts, as by a sling; or to bind them to splints, or to the body; and to quiet the muscles, &c.).

Hæmorrhage.

Every wound bleeds, because in every wound blood-vessels are injured.

But the kind of hæmorrhage, as well as its danger, varies with the size and nature of the blood-vessels which have been injured. If the blood does not flow freely, but trickles gently from the wound, only small blood-vessels (capillaries) have been divided. When dark blood wells out in a steady stream, and when the flow is increased by pressure applied *above* the wound, then a large vein has been opened.

When bright-red blood spirts out of the wound forcibly and in jerks, an artery has been wounded and danger to life is great.

Unimportant hæmorrhages, from the smallest arteries or from veins may be arrested by pressure on the wound itself, or by pressing the sides of

the wound against each other; or it may stop of itself, because the mouths of the injured vessels

FIG. 7.—Wounded Artery.

contract and the blood in the wound coagulates into a viscid tough mass. It is often sufficient to elevate the wounded limb perpendicularly, as this very materially lessens the flow of blood to the part. Hæmorrhage from an injured vein (as from the giving way of a varicose vein in the leg) is sometimes difficult to stop on account of the pressure of some tight article of dress (a garter for instance) above the bleeding point. On loosening this, slight pressure and elevation of the limb suffice to arrest the bleeding.

FIG. 8.—Wounded Vein.

Should, however, bright-red blood continue to flow in spite of pressure over the wound, a large

artery must have been wounded, and death from loss of blood is to be apprehended.

In such cases prompt aid is necessary. The surgeon should at once be sent for, or the patient be transported to him. The surgeon will stop the hæmorrhage by tying the artery.

But as the patient may die before the arrival of the surgeon, those around should endeavour to stop the flow of blood. The only efficacious way of doing this is by firm pressure on the wound itself if it be small, or on the trunk of the artery above the wound. The injured limb should be raised, as this lessens the flow of blood, and the clothes should be cut away from round the wound. Then a piece of linen or a pocket-handkerchief, folded into a thick pad, should be laid on the wound and fastened firmly on by means of a bandage or handkerchief. If in spite of these means the blood still continues to flow, one must try to find the trunk of the artery between the heart and the wound and press it firmly with the fingers.

In some parts of the body the arteries lie so near the surface that they can be effectually compressed by the finger against the underlying

bones, and these it is well to know. In the *upper arm* the artery lies on the inner side of the arm in a line with the seam on the coat-sleeve: one can compress this artery by placing a thick stick between the arm and chest and tying the arm tightly to the body (fig. 10), or by pressing the artery against the bone with the thumb, as in fig. 9.

In the upper part of the thigh the artery lies in front, just below the middle of the groin (fig. 11).

The flow of blood through the artery of the neck may be arrested by pressure applied at the root of the neck immediately above the collar-bone and to one side of the windpipe (fig. 12).

It is at these points that a surgeon generally applies pressure (as with a tourniquet) when he wishes to stop hæmorrhage; it is at the same points that he cuts down on the arteries when he wishes to tie them.

But to stop hæmorrhage by pressure applied at a particular point we must have, on the one hand, a certain amount of anatomical knowledge of the part, and, on the other, a certain amount of practice and handiness, as well as strength and perseverance if surgical aid is long in arriving.

FIG. 9.

FIG. 11.—Compressing the Artery of the Thigh.

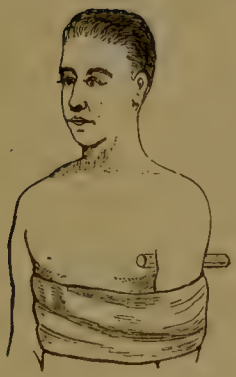

FIG. 10.

FIG. 12.—Compressing the Artery going to the Head and Face.

Very often in transporting a patient the best-applied tourniquet or compress may shift a little: it then does more harm than good.

It is, therefore, much simpler and safer to use an elastic bandage, made of indiarubber (either flat or tubular), by means of which the limb is bound up so tightly that blood can no longer flow through its vessels. If an elastic bandage be put (no matter how tightly) only once round a limb, the pressure will not suffice completely to compress the blood-vessels; but if it be bound several times round at the same point, every turn so increases the pressure that in a short time no more blood can pass (fig. 13). The newest kinds of tourniquets with which ambulance carriages for troops, surgeons' instrument cases, &c., are provided, consist now merely of a flat or tubular indiarubber bandage. But if one of these be not at hand, then other means must be used. For instance, if you have a linen bandage you should bind it round as tightly as possible at one point, being careful that every turn in the bandage covers the former one. When the end of the bandage is well fastened, it should have water freely poured over it. The wet causes the

bandage to shrink so much that the pressure thus induced suffices in many cases to stop the hæmorrhage.

If you have nothing by you but a handkerchief, you should fold it together like a cravat, put

Fig. 13.

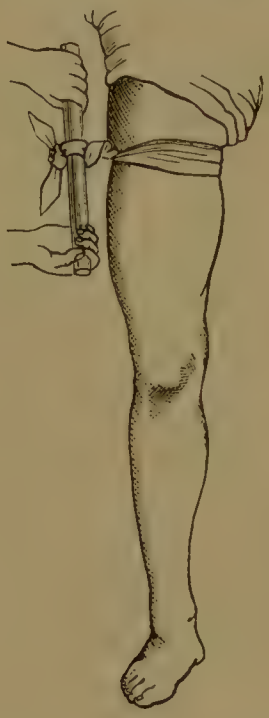

Fig. 14.

it loosely round the limb, tie the ends together, pass a short stick under it (a walking-stick, door-key, branch of a tree, a sword in its sheath, or a ramrod, will do) and twist this round and round

till the bleeding stops (fig. 14). But an elastic bandage is in all cases to be preferred, as its effect is greater and more lasting.

For this purpose I have recently had an india-rubber brace made consisting of one piece, and so long that by means of it you can compress the artery in the thigh of the strongest man. It would be well if those who wear braces were to have them made of this material; they could then use them to arrest hæmorrhage from the legs or arms either in themselves or others. If such a belt were worn by every soldier in time of war, difficulty in cases of hæmorrhage on a battle-field would seldom occur. For other men, too—especially travellers, sportsmen, those who work in manufactories, railway guards, policemen, &c.—it would be a desirable thing to wear them, as anyone may some time or other be placed in circumstances in which such a belt would be of service to himself or others. Those who have seen the wonderful efficacy of the elastic bandage in checking hæmorrhage are apt to be too ready to employ it in the first instance in every case of sharp bleeding. It would, however, be absurd to use it for a cut finger. Only when elevation,

pressure on the wound by firm bandaging, and pressure on the artery supplying the part have been tried and found ineffectual, should the elastic bandage or its substitute be called into requisition.

In whatever manner, however, the flow of blood to the wounded part is prevented, it is imperative to transport the patient to the surgeon as quickly as possible; for a sufficiently tight pressure on the injured part cannot be borne for any length of time. Not only does great pain ensue, but the part from which the blood has thus artificially been withdrawn shows signs of mortification if the natural supply be withheld for longer than from three to four hours. In the same way, if this tight bandage be applied at any unsuitable point of the body much harm may be done. For this reason the greatest attention is paid during instruction given in bandaging to point out that a bandage applied for arresting the flow of blood causes great swelling below the part bandaged, and if not loosened soon may cause that part of the limb to perish.

When the hæmorrhage has been stopped, then the wound must be dressed and bandaged in the manner already explained.

Above all things I must earnestly warn you against using those remedies for stopping hæmorrhage which are so often stuffed into bleeding wounds—both those got from the chemist, such as perchloride of iron, yellow charpie, &c., and more popular remedies, such as spider's web. It is possible by such means to arrest trifling hæmorrhages, but properly applied pressure attains this end much better, and after what I have told you of the danger of letting any impurity come in contact with a wound, you will easily understand that such means are generally hurtful, and must in any case prevent the speedy healing of a wound by *primary* union.

Hæmorrhage from Internal Organs.

Hæmorrhage from the lungs may be caused by a sudden blow or other injury to the chest, but more commonly proceeds from phthisis where a blood-vessel of some size has been eaten into by the disease.

The patient suddenly becomes aware of a sensation of warmth rising up in his chest; he begins to cough up bright red, frothy blood, oftentimes in

great quantities. Although experience has taught us that even considerable hæmorrhages of this kind are seldom immediately fatal, yet it behoves us to use every means to arrest such a hæmorrhage and to prevent its recurrence.

The patient should be placed in a recumbent position, with the head raised, every care being taken to make him as comfortable as possible, so that there should be no distress in breathing, and all coughing avoided if possible. The patient should be encouraged and spoken to hopefully, and everything should be avoided which could possibly disturb, excite, or distress him. Cold compresses should be placed on the chest, cold water to drink—but only in small quantities—may be given, as well as small pieces of ice to suck. The doctor, however, who will have at once been summoned, will order the necessary remedies and direct what should be done.

Hæmorrhage from the stomach (hæmatemesis) is caused by gastric ulcers and tumours. The patient is seized by sudden violent pain in the pit of the stomach, accompanied by the vomiting of dark, often of brown-coloured, blood resembling coffee-grounds, and becomes collapsed. In this

case also the patient should be placed in the recumbent position, and his clothes loosened. It is best to apply cold compresses to the stomach, and to give the sufferer small pieces of ice to swallow. In cases of internal hæmorrhage, the result of injuries to the liver or stomach, the patient is seized with violent pains, becomes deadly pale, and may die without any apparent outward injury.

In such cases the non-professional person can, by enforcing absolute quiet in a comfortable position, endeavour to prolong life, and the surgeon himself will be able only by means of a major operation to save the sufferer's life.

Nose bleeding is a most common occurrence. In very profuse hæmorrhage from the nose, sniffing up cold water slowly through the nose, the loosening of the clothes at the neck, holding the head back, as well as the arms over the head, cold compresses on the bridge of the nose and back of the neck, as well as on the calves of the legs, and plugging the nostrils with cotton-wool, are simple means of arresting the hæmorrhage.

Hæmorrhage from the bowels necessitates the instant attendance of the doctor, and till his arrival the patient should be kept lying flat on his back.

Hæmorrhage from the ear, following an injury to the head, generally points to a fracture of the skull involving the temporal bone in which the inner ear is enclosed. The blood in these cases flows partly into the cavity of the skull, and exercises injurious pressure on the brain, and partly finds its way outwards through the damaged drum of the ear and along the outer passage.

FIG. 15.

Poisoned Wounds

are caused by the bites of mad dogs, poisonous snakes, and by poisoned arrows and spears. The danger of these is, that the poison from the wound may by means of the lymphatics be carried to the heart, and so poison the whole blood.

To prevent this diffusion of the poison, you should, without loss of time, bind the limb round tightly above the wound (fig. 15): this is best done with an elastic belt or a strap, or string, or

a handkerchief made tight by means of a stick twisted round in it. When this has been done, you should try to get rid of the poison from the wound. This may be done by sucking it out (if the lips be not sore), by burning with hot coal, hot knife or knitting pin, or by caustic (carbolic acid, nitric acid, &c.). In cases of snake-bite ammonia is used externally, and brandy or other stimulant is also given internally. Send at once for the doctor, and, if the wound has been caused by the bite of a dog, shut up and watch the suspected animal. If you destroy a dog supposed to be mad, the wounded individual will always be in fear of hydrophobia, whereas by preserving the animal time may prove that he is not mad, and the patient be thus relieved from his fears.

It goes without saying that it is only in cases of rapid diffusion of the poison into the system that the tight bandaging of the limb can be of any use, and that it would be a grievous error, fraught with fatal consequences, to treat inflamed parts, as in cases of pyæmia, erysipelas, &c., in such a manner. In cases of bad stings from insects, the application of ammonia to the reddened surface is very useful ; as is also the use of ichthyol and menthol.

LECTURE III.

FRACTURES.

BONES are hard but brittle, and break like glass or porcelain by outward force (blow, fall, jump, &c.), often with a snap or crack which may be heard and felt.

Fractures are divided into two kinds—simple and compound. We call a fracture *simple* when the skin is not injured. We call it *compound* when it is accompanied by a wound, caused either by the same force which produced the fracture (a bullet, for instance) or by the ends of the broken bone protruding through the skin.

For instance, a man may fall from a tree and break the lower part of his thigh, and the broken end of the bone may be driven through the skin and into the ground.

Compound fractures are much more dangerous than simple ones because the piercing of the pro-

tecting covering which the skin affords opens the way for the entrance of dirt and poisonous germs into the wound. Should these find their way into the bone, inflammation of the bone marrow follows, which may involve the whole medullary cavity of the bone (*medulla*, marrow), and render it very difficult or impossible to save the limb. In cases of compound fracture it is not necessary that the fractured bones should be seen protruding through the skin ; oftentimes they slip back again. It is therefore desirable that we should look upon every fracture as compound, and that the limb be bandaged with every antiseptic precaution if the skin exhibits the slightest wound in the neighbourhood of the fracture.

How do we know when a bone is broken ?

1. The limb is bent or shortened.

2. There is an unnatural degree of movement at the seat of the fracture.

3. There is violent pain.

4. When the limb is moved, the broken ends of the bone may be felt grating against each other.

5. The limb cannot be used.

How does a fracture heal ?

New bone substance (callus) is formed at the

broken ends of the bone and knits them together. This new substance is at first soft, but hardens gradually into bone. The time necessary for the completion of this process varies from two to six weeks, according to the size and strength of the bone. If during this time the broken ends of the bone have remained perfectly quiet in their proper position, the bone joins so perfectly as to leave no outward sign of the injury. If this has not been the case, the bone joins crookedly, or is shortened ; or it may perhaps retain mobility at the injured place, forming what we call a 'false joint.'

How does the surgeon assist the healing process ?

1. He sets the fracture : *i.e.* by means of pulling and manipulation he brings the broken ends of the bone into their proper position. The pulling he may allow his assistants to do, but the manipulation he does with his own hands.

2. He then adopts measures to keep the broken ends of the bone fixed in their right position till the fracture has healed. This perfect rest he attains either by means of splints (made of wood, tin, pasteboard, &c.), which keep the limb extended, and which are secured by bandages or handker-

chiefs; or by some material such as plaster of Paris, starch, &c., which stiffens round the limb and forms a sort of casing.

What can one do in a case of fracture when no surgeon is at hand, and when the patient has to be removed to a hospital or to a doctor?

He can put on a temporary dressing, so that the *simple* fracture shall not become compound through the risks attendant on removal, and thereby lessen also the sufferings of the injured person.

In a case of injury it is necessary to see whether there are broken bones or not. Often this can be at once discovered through the clothes by the altered appearance of the limb.

If not, the clothes and boots must be cut off—*not* pulled off. When a fracture has been discovered, one must look about for material to use as splints, and for means with which to fasten them on.

The more composedly one considers the situation, the more easily the necessary materials are to be found everywhere. In the first place, the choice of materials will be largely governed by the locality in which the accident has happened.

1. If in a town or near an inhabited locality, one endeavours to procure boards—very thin boards—cigar-boxes (they can be cut or sawn in two), laths, broomsticks, yard measures, pasteboard (books, journals, hat-boxes, &c.), felt (old hats), foot-mats, baskets, &c. From the kitchen, cooking spoons, tongs, shovels, &c., can be obtained.

From the bystanders one begs for their walking-sticks, umbrellas, parasols.

Fig. 16.

2. If the accident has happened out in the country or in a wood, one can find branches, twigs, bark, reeds and straw, bits of fencing and paling; and can make pads out of coat-sleeves or shirt-sleeves, stockings, &c., stuffed with grass, hay, and straw.

3. On the field of battle one may utilise muskets, bayonets, scabbards, lances, leather and felt from saddles, stirrups, telegraph wire. Of whatever material the splint is composed, however, it must be well padded before being applied. For padding one uses wool, cotton-wool, flannel, tow, flax, jute, hay, moss.

4. If, however, no material of any kind is to be found which can be used as splints, one must endeavour to help one's self by looking for some *point d'appui* in the patient himself. One can bandage the broken leg to the sound one—or fasten a fractured arm to the side by a firm bandage over the chest.

For fastening the splints, we may use binders (children's binders), pocket-handkerchiefs, neck-handkerchiefs, stockings, sheets, cord, garters, &c., as well as the clothing which has been cut off from the injured person—for instance, the boot which has been cut up, as a foot-rest ; on battlefields one can find for this purpose straps of all descriptions (stirrup-leather, &c.).

It is almost impossible to bind up a broken limb entirely without help. It is necessary to have one person—or, even better, two—who by constant gentle pulling on the bone near the joints, one each side of the seat of the fracture, will separate the broken ends from each other, and then lifting the limb keep it in that position till the padded splints have been carefully fixed. In order to keep the limb in proper position afterwards, the fractured arm is placed in a sling and the broken leg with

its properly adjusted splints is bound firmly to the sound leg.

After having put splints on and bandaged the injured person with the means you have found, the next thing is to get ready a stretcher, or to procure a carriage, on which to place the patient, and then transport him carefully to where he can get surgical aid. But of that I will speak later on. If there should be no possibility of transporting the patient carefully to the surgeon, it is far wiser to leave him under supervision where he is till you can obtain the proper help and means of transport. How dangerous blind haste may prove in these cases is seen in the following example. A man meets with an accident and breaks his leg—his friend at once hails a cab and places the sufferer in it with the help of the driver and takes him off to the hospital. In intense suffering caused by the jolting of the cab the hospital is reached at last and the surgeon diagnoses a compound fracture, the point of the bone having pierced through the trouser. The process of healing is thus made long and tedious. How much better would it have been if the friend had applied a temporary splint either with his stick or umbrella, &c., and had transported

the patient into the nearest house or cottage, and then have looked about him for a suitable means of transport? In case of necessity it would be time well spent to procure a stretcher from a hospital or an ambulance station or the like. In general, one may say that care and forethought are more required in these cases than haste.

DISLOCATIONS.

Persisting displacement of the ends of the bones forming a joint, after the ligaments and capsule of the joint have been torn, is called a dislocation: the joint soon becomes suffused with blood. It is the result of outward violence (*i.e.* a fall, wrestling, &c.), which has forced apart the articular ends of the bones and caused them to assume a relative position which interferes with the appropriate movements of the joint.

How does one recognise a dislocation?

1. By the altered appearance of the joint—generally very apparent when one compares the corresponding joint of the other side.

2. The mobility of the joint is lessened.

3. Efforts to move the joint cause much pain.

Treatment.

The joint must promptly be replaced in its normal position ; but this must be done only by the surgeon.

One must not try any experiments, but wait quietly till the surgeon comes, or transport the patient carefully to him, with the limb well supported by the triangular bandage.

SPRAINS.

Sprains are injuries resulting from the twisting and tearing of joint-ligaments, and injury to the articular ends of bones through outward violence (through a fall, blow, &c.). The joint shows no distinct alteration in its appearance (compare it with the corresponding joint), but it swells very quickly (owing to effusion of blood)—all movement becoming difficult and painful.

Treatment.

Keep the injured part perfectly quiet till the doctor arrives—only perhaps putting on cold compresses, by means of wet cloths or handkerchiefs ; or transport the patient carefully to the doctor.

Rubbing and 'massage' of the joint are often of great use, but only when prescribed by the doctor. The so-called 'bone-setters' often understand this treatment well, but not unfrequently also do great harm.

HERNIA (RUPTURE).

This is a tumour formed by the protrusion of more or less of an organ from its normal position. There may be ruptures of various organs, but the injury to which I now call attention, and which is commonly understood by the term 'hernia,' is the protrusion of a portion of the intestine through some abnormal opening in the walls of the abdomen —a protrusion which can be felt under the skin as a soft swelling. These protrusions or tumours can be 'reduced' and kept in their place by a truss or bandage specially made for the purpose. Everyone suffering from such an affection is, as a rule, well able himself to 'reduce' his rupture. When, however, the rupture cannot be reduced or pushed back, matters become very grave and urgent. Such an accident is generally the result of some violent exertion, or it may be caused by imprudence in diet. The hernia becomes then what is termed

'strangulated' (it is fixed, so to speak, as if in a vice). The symptoms are great pain, followed by sickness and vomiting.

In such cases no time is to be lost, for if measures of relief are not promptly taken, the portion of intestine which is strangulated becomes gangrenous, and death follows. The doctor must be sent for at once: he either reduces the hernia by manipulation, or, if that is impossible, operates. Till surgical aid can be obtained, however, it is advisable to lay the patient over the back of a couch, with his legs drawn up—the lower part of the body being supported and raised higher than the sufferer's head: then the tumour or swelling should be gently pressed. This position and the gentle pressure will often cause the portion of intestine to slip back again. It is of paramount importance that a strangulated hernia should be attended to without delay, for if but even a few hours are allowed to elapse it may be impossible even for a medical man to reduce the hernia without an operation.

BURNS

are caused by the concentrated heat of fire, heated metal or other substances, directly applied to the

surface and destroying the skin and tissues underneath.

Boiling liquids or steam produce scalds.

Strong caustics, such as oil of vitriol or caustic potash, produce 'eschars.'

In their results these three different kinds of 'burns' are much the same.

We recognise three degrees of burning, according to its intensity.

1. Mere painful redness (superficial inflammation).

2. The formation of blisters.

3. Charring.

Among the many causes of accident by fire I will mention only those which nowadays most frequently occur, and which ought to warn us all to carefulness.

Besides fires at theatres, which claim such hosts of victims, we have gas explosions, which are generally due to carelessness in not turning the gas off. We have burning by petroleum, which is generally attributable either to its improper use, or to careless handling of petroleum lamps.

In general, women are more careless about fire

than men. How often are the light clothes of ladies set on fire by the careless handling of lighted candles, lamps, &c. !

Almost every day the newspapers tell us of fires caused by children who have been allowed to play with matches ; and how often, too, it happens that a careless mother or maidservant places a jug of boiling milk or soup in such a way that little children, seizing it, pour the contents over their faces, necks, breasts, and arms ! These cases, alas ! come too frequently under our notice in the hospitals, where we have to operate on the disfiguring scars caused by these injuries.

How many such accidents could be prevented if everyone who was a witness of such gross carelessness considered it his duty to impress the necessity of proper care !

But many, alas ! remain silent and go their own way, like the Priest and Levite, and excuse themselves by saying, 'What does it concern me ? Let everyone take care of himself.'

Let everyone beware of leaving matches, or jugs containing boiling fluids, within reach of children.

It would be well if the light material of which ladies' ball-dresses are made, and that used for

curtains, &c., were to be rendered incombustible. This process is simple and inexpensive, and the colour of the material is not impaired by it. Everyone should know that it suffices to dip these materials in a preparation of sulphate of ammonia, and then to dry and iron them; should they then come into contact with a flame, they do not blaze, but smoulder slowly, like tinder.

What can be done when a woman's clothing has caught fire?

Flames envelop the unhappy creature, scorch her arms and hands, her neck and face: her hair and cap blaze up. The best thing she could do would be to throw herself on the ground and roll about there, and thus by pressure extinguish the flames. Unfortunately, she seldom has the presence of mind to do this, but rushes about screaming loudly: the draught increases the flames, and she becomes a moving pillar of fire.

What should then be done?

One should not rush off to fetch water, but seize upon the first available rug, or even tear off one's own coat, wrap it round her, and, throwing her on the ground, roll her about there till the flames are put out.

Only then should one fetch water—a great deal of water—and drench her with it, as the smouldering clothes continue to burn into the flesh.

In scalding by boiling water or steam (boiler explosions) cold water should be plentifully poured over the person and clothes. The injured person should then be carried carefully to a warm room, laid on the floor on a carpet, or on a table, but not put into bed (as there it becomes difficult to attend further to the injuries), and a doctor at once sent for.

If the patient complains of thirst, a warm stimulating drink should be given (such as tea), as after severe burning the temperature of the body immediately begins to fall.

The clothes must next be removed, and this is to be done with the greatest care and caution. For this purpose you should if possible have the help of two people: the one should be on the side of the patient opposite to that on which you are standing, whilst the second should hand the necessary things. All bystanders should be asked to leave the room.

You should then get a good large pair of scissors or a sharp knife, and carefully cut through

the clothing in such a manner that it falls off of itself. Nothing should be removed by pulling or tearing, as that would break the blisters.

On no account, through false economy, try to save any part of the clothing.

Should any of it adhere to the skin, you must leave it, only cutting round it with a sharp knife or scissors. Sawing slowly through the clothes with a blunt knife causes immense suffering. Above all, do not break any of the blisters, as by so doing the raw surface would be exposed, but when the blisters are very large, one may prick them with a needle so as to let the fluid run out. If no doctor has yet arrived, the next thing to be done is to protect the burnt surface from the air.

Compresses of cold water generally increase the suffering. A covering of grease, oil, or some dry substance is far more soothing, and generally alleviates the pain more rapidly. Should one of the packets of antiseptic dressings previously mentioned be at hand, the burns may be temporarily covered with a dry dressing. Should nothing of the kind be available, various household remedies may be applied which justly enjoy a certain reputation, and which will be useful until the

doctor arrives and replaces them by better antiseptic applications.

Among these household remedies may be mentioned anointing the wound well with oil (lamp-oil, salad-oil, castor-oil, or any at hand); painting it over with grease, lard, butter, &c.; powdering it with flour, starch, powdered charcoal, &c.; or wrapping it round carefully in clean soft wadding from which the outer covering has been removed.

If there should be a chemist near at hand, send for a liniment composed of equal parts of linseed-oil and lime-water,[1] and put this on the wound, covering it over with wadding or rags of fine linen. In changing these rags great care should be taken not to cause unnecessary pain.

The antiseptic treatment which I described to you in my lecture on wounds has of late been used for burns with the happiest results.

The matter which is very freely given off from burnt surfaces soon emits a most offensive odour, which is not only distressing to the patient but

[1] Called in this country 'Carron oil,' from its having been first largely used at the Carron Ironworks in the treatment of burns from molten iron, which so frequently occur in such works.

also exposes him to the dangers attendant on suppuration, which have been already described.

It is therefore necessary to mix an antiseptic substance with the remedies applied—*e.g.* add carbolic acid or thymol to the oil used, or apply it afterwards, if not at hand at the moment. Or this may be left until the arrival of the doctor. These antiseptic remedies, particularly thymol, not only prevent the bad odour from the suppuration, but tend also to alleviate the suffering. It is therefore much to be desired that chemists should always keep ready mixed an ointment for burns containing one per cent. of thymol.

After very extensive burns and scalds the patients (particularly children) are often very quiet, experience little pain, only occasionally sighing and asking for water to drink: this generally is a sign of approaching death. Sometimes death can be warded off even in these cases by hot baths and the injection of human blood into the veins; but for this purpose medical aid must be very quickly procured.

Should anyone have fallen into a lime-kiln or soap lye, he should be drawn out as quickly as possible, have water plentifully thrown over him,

or be thrown into water, so as to get rid of the lime. The caustic action of the lime or soap lye is best counteracted by some acid—by washing the injured part with vinegar and water or diluted sulphuric acid; then oil should be applied as in the case of ordinary burns.

Should anyone have had acids poured over him (sulphuric acid, nitric acid, vitriol, &c.), it is necessary, besides washing the injured parts freely with water, to use whatever alkali may be at hand—*e.g.* soda, lime-water (which can be made by dissolving a piece of mortar or plaster in water).

ACCIDENTS CAUSED BY ELECTRICITY.

a. Lightning.

If a person be struck by lightning he is generally killed on the spot. The appearance of the person does not always betray the violent effects of the electric fluid, and oftentimes he is found on the same spot and in the same position as he was at the moment in which he was struck.

In less severe cases, where the symptoms are only those of concussion of the brain, the sufferers generally recover. Partial paralysis and pains in

the limbs disappear gradually as a rule, though oftentimes restlessness and paralysis of speech or of sight and hearing or of the lower limbs continue for some considerable time.

Those who have recovered from such a serious accident are never able to give an account of their sensations, because the effect is so instantaneous that they cannot remember to have seen or noticed the flash of lightning. A flash which one has seen should therefore not make us apprehensive. The destructive power of lightning is enormous. The person who has been struck by it may have his limbs torn off from his body, and his clothes torn to shreds, and he may receive serious wounds from being thrown down and hurled to a great distance.

The effect of burning is chiefly apparent on the skin. At the points where the electric fluid penetrated and passed out again you find small round burns, also extravasated blood and blisters. The clothes also show round holes with burnt edges. Keys and watch-chains get melted down or bent.

The 'first aid' to be rendered to a person struck by lightning consists in placing the sufferer

in a cool, shady spot, to remove his clothes and to continue uninterrupted artificial respiration and massage round the heart (in the same manner as is done in cases of drowning) till the arrival of medical aid.

b. By Artificial Electricity.

If by any accident a person should be struck by the electric current of a badly insulated electric installation or by insufficiently protected electric wires—through which a strong current passes—the results may be severe burns, absolute unconsciousness, and even instant death.

The nature of the injury depends on the amount of resistance offered to the electric current by the clothing and the constitution (or condition) of the human skin. In saltworks, breweries, chemical factories, where acids, &c., are dealt with—in industries where salts and acids are worked up—the skin of the workpeople employed in such works gradually becomes so saturated with the salt and acid solutions that it offers but a very slight resistance to the electric current.

Accidents, therefore, in such factories, which are caused by electricity, are generally dangerous.

Besides this the physical constitution plays a great part. Men who through the immoderate and constant use of alcohol have injured their constitutions are much more liable to the dangerous effects of the electric current.

The 'first aid' to be rendered to sufferers from accidents caused by artificial electricity is in the first place to remove the patient from contact with the electric wire or the dynamo. The Electro-technical Union (in Germany) have recommended the following measures for dealing with these cases :—

1. The engine should be stopped or the affected wires disconnected entirely from the source of current (dynamo, transformer).

2. If this would take too long, attempts should be made to short-circuit the current, or to earth it by connecting the wire with water pipes, iron pillars, &c.

3. If the injured person is in contact with only one wire, it is sufficient in many cases to earth the latter or to lift the patient from the ground.

4. If a short-circuit is not established, only that wire need be earthed which is in contact with the patient.

5. The person bringing help should observe the following rules for his own safety :—

a. All contact with the current wire, even if short-circuited, as also with the injured person who is in contact with the wire, is dangerous so long as the current is not earthed.

b. The helper should therefore insulate himself from earth by standing on glass, dry wood or clothes, and should seize the patient only by his clothes, or should use a dry cloth or a piece of dry wood with which to remove him from contact with the wire.

c. Short-circuiting of the current is preferable to earthing if it can be brought about by throwing a wire, a wet cloth, &c., across the wires without the helper bringing himself in contact with the current wire. Otherwise it is advisable in the first place to earth the particular wire with which the patient is in contact.

d. In earthing, the wire, iron rod, or whatever is used for the purpose, should be brought first into good contact with the earth, and then with the current wire.

LECTURE IV.

FROSTBITE.

THOUGH this accident is most apt to occur when the degree of cold is intense, it may also happen when the cold is by no means severe, especially if the person exposed is exhausted by long marching or by hunger, or is stupefied by drink, especially if in such circumstances he sits down to rest when a cold wind is blowing.

If snow is falling heavily at the same time, it is in his favour, for snow is a bad conductor of heat, and those who have been snowed up are more easily resuscitated from the effects of the cold than others who have not been protected by the snow. In those who are frozen the whole surface of the body becomes white and cold, with a bluish tint on the nose, lips, hands, and feet. The limbs become stiff, and the extreme points of the body—nose, ears, fingers, toes,

arms, legs—are often frozen hard, and are as cold as ice.

Endeavours to restore life should be made with the greatest care. If you bring the patient suddenly into a warm room, death follows most certainly. He should be carried carefully into a closed but cold room, and undressed with care for fear of breaking the stiffened limbs.

If snow is to be had, cover and vigorously rub the whole body with it. If not, cover and rub the patient with cold wet cloths or cold sand, or put him into a cold bath. Alternately with this, one should try artificial means to restore the breathing (as in cases of drowning). If the patient begins to breathe naturally, and the limbs become less stiff, he should be carried into a moderately warm room and covered lightly over with cold coverings and sheets. After this only he may be rubbed by degrees with warm cloths, and the warmth of the room gradually increased.

Then we should try by means of smelling-salts, ammonia, ether, &c., and slightly stimulating drinks, such as light cold wine, cold coffee or soup, to recall consciousness.

Should any part of the body remain without

sensation, blue, swollen, or blistered, then there is great danger of mortification setting in. By bandaging and raising the body this danger can sometimes still be averted. ..

DROWNING.

Everyone should consider it his duty to learn to swim, not only to save himself, but to be able to render assistance to others who are in danger of drowning. It is the duty of all parents to see that their children are taught to swim—once learnt, it is never forgotten.

The consciousness of being able to swim gives courage and presence of mind to those in danger of drowning, whilst those who cannot swim generally become paralysed with terror, lose their heads, and are unable to help themselves. They render it difficult, dangerous, and sometimes impossible for others to save them. They clutch hold of the persons swimming to their aid and prevent them from keeping them above water and bringing them into safety.

The general impression is still prevalent among sailors that it is far better not to be able to swim. They maintain that should they fall

overboard, it is better to sink at once than to struggle to keep yourself afloat with death staring you in the face. This is an erroneous impression, for experience has taught us that sailors have often been saved after they had been struggling for some time in and against the waves. It is therefore much to be desired that this false idea be combated in every possible manner.

If a person who has not learnt to swim falls into the water, he may save himself from drowning (1) by lying on his back and throwing his head backwards, and his mouth upwards; (2) by keeping his lungs well filled with air (by long inspirations and short expirations); and (3) by not raising his arms out of the water. As this is not generally known, I will prove it to you by the following experiment on this doll. As long as its arms are under water the mouth remains, as you see, above it; but no sooner are the arms raised than the mouth sinks under the surface of the water.

I have known several cases in which women and even children who could not swim, and who had got out of their depth whilst bathing, saved themselves in this manner.

It results from the fact that a human body

is a little lighter than a quantity of water its own bulk; in other words, it is lighter than the amount of water which it displaces when immersed. If the arms should be raised, as when calling for help, then it follows that the head must necessarily sink so much deeper.

It is therefore very desirable that all who learn to swim should first learn how to float on the water without making any exertion. This can easily be practised and learnt in fresh water. If the arms are stretched out behind the head, the body takes a horizontal position, and the face and mouth remain above water.

If the arms are stretched out backwards, the weight of the upper and lower part of the body is pretty evenly balanced.

If, however, the arms are kept close to the body, the lower part becomes heavier, the feet sink down, and the body assumes a more upright position. To keep the mouth above water in this position, the head must be thrown right back, which for any length of time is very fatiguing. But every swimmer knows that in this position a very slight movement of the hands and feet suffices to keep the head above water.

When a man falls into the water, either from the shore or out of a boat, and there is no swimmer at hand to rescue him, it suffices generally to reach him an oar or a rope, because a drowning person generally rises once again to the surface before becoming suffocated, and then, as the proverb says, 'catches at every straw.'

If however there is nothing of the sort at hand, it is well not to lose one's presence of mind but to pull off one's coat, and holding it by one sleeve throw the other, or the coat-tails, to the drowning person, thereby establishing a communication with him.

An old ship's captain told me that he had saved many lives in this way. If the person who is anxious to help the drowning man can swim, he should jump into the water and endeavour to seize hold of him—but on no account let the drowning man hold on to him—as in that case both might be drowned together. If possible the person going to the aid of the other should take a rope with him, which is fastened either to a boat or to the land, or held by people on the shore.

When a person has broken through thin or

rotten ice, and cannot extricate himself on account of the edges of it constantly breaking away, it is well known that the best means of helping him is to throw him a long ladder, board, or pole, because by this means the weight is distributed over a larger surface. It is a good plan, too, to attach a skittle-ball to a long cord by means of an iron hook and roll it to the person in distress, so that he may hold on by it till further help comes.

Death through drowning results from two causes :

1. Generally from suffocation, when water instead of air enters the lungs. A person who dies in this way fights long against death, and presents the appearance of having been suffocated : the face is swollen and purple, the lips are livid, and the eyes are bloodshot ; there is much water in the stomach, and the mouth, windpipe, and lungs contain a frothy fluid.

2. More rarely faintness ensues immediately, *i.e.* the heart-beats and respiration cease, the entrance to the windpipe is closed spasmodically, so that but little water can get into the lungs. The face of the drowned person is pale and flabby

and there is but little frothy fluid in the mouth. In this case restoration to life is more hopeful than in the previous one.

As life may not be extinct even after hours spent in the water, it is well to consider all drowned persons as only apparently dead. Indeed, life has not unfrequently been restored after long hours of unceasing efforts.

The efforts to restore life must be carried out with quietness, caution, perseverance, and continuous energy. The following rules will be found applicable :—

1. Send at once for the doctor, and at the same time for sheets and dry clothing.

2. Efforts to restore life should at once be resorted to energetically, and if possible in the open air, except in very bad weather, great cold, heavy rain, &c.

3. The first and most urgent task is to restore respiration. With the exception of removing the wet clothes and drying the skin, no efforts to restore the circulation and the warmth of the body should be made till respiration has been established, otherwise the result may be imperilled.

4. The efforts to restore life must be continued uninterruptedly until the arrival of medical aid, or till respiration and the action of the heart (pulse) have ceased for hours.

5. The drowned person should not be placed head downwards, nor lifted up by his legs, but he should be laid on his stomach, supported by rugs or articles of clothing, with one arm under the head, and the head lying rather lower than the body, in which position the water collected in his mouth is got rid of.

6. In order that the air may have free ingress to the windpipe, the mouth should be opened and all mud, &c., removed from it and from the nostrils with a pocket-handkerchief; the tongue should be drawn forward and kept in that position (an elastic band over the tongue and under the chin will do this best), and the jaw pushed forward.

7. The wet clothes must be got rid of; and, first of all, all tight clothing about the neck and chest (neck-handkerchiefs, shirt-studs, braces).

8. To excite natural respiration snuff or smelling salts should be applied to the nostrils, or the throat tickled with a feather; rub the chest and face briskly, and dash hot and cold water alter-

nately on them, or beat the chest with a wet towel.

9. If these efforts prove fruitless, one should not waste too much time over them, but at once proceed to artificial respiration.

Artificial Respiration.

10. The object of this is to cause the chest alternately to expand and contract, so that fresh air may penetrate into the lungs.

11. These movements may be carried out in different ways, but Silvester's method is the best—and I would strongly recommend it, because I have seen the best results from it in my own hospital; and also because, should necessity arise, it may be put into practice by one person alone, in the following manner:

12. Place the apparently dead person flat on his back, raising his head and shoulders slightly by means of a folded article of dress.

13. Stand behind the patient, grasp his arms just above the elbow, and draw them gently and steadily upwards over the head, keeping them in that position for two seconds; by this means the

chest expands and air is drawn into the lungs (fig. 17).

14. Then carry the arms back again in the same way and press them gently and firmly against the sides of the chest for two seconds; by this means the air is pressed out of the lungs again (fig. 18).

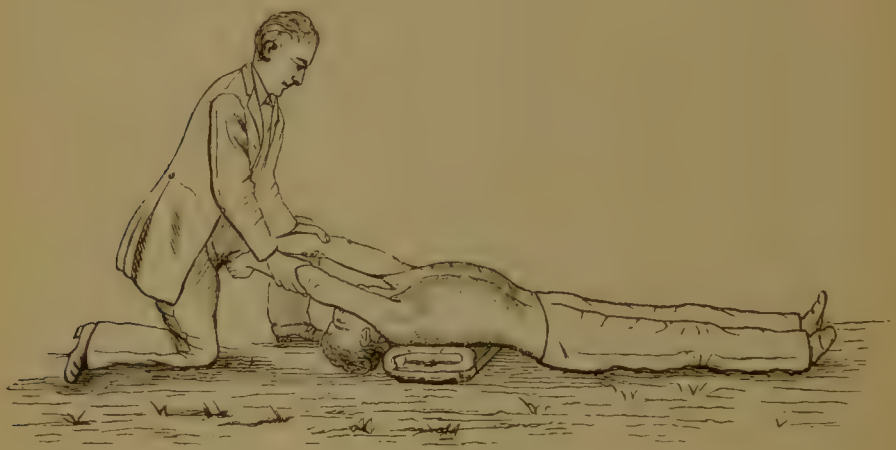

FIG. 17.—Inspiration (Silvester's method).

15. If two persons are at hand to render assistance, then they should stand on either side of the drowned person; each seizes an arm, and at the word of command, 'One, two, three, four,' they both simultaneously make these movements.

16. These movements are to be repeated carefully and perseveringly, about fifteen times in a

minute, till natural respiration begins. The first evidence of this is a sudden change in the colour of the face (pallor changes to redness, and *vice versâ*).

17. Another method, which, as well as the foregoing, is in use in the English navy—viz. that of Marshall Hall—is also very efficacious, but to

FIG. 18.—Expiration (Silvester's method).

my mind not so good as the former. It can only be carried out when several people are at hand to help. The process is the following:

18. Lay the patient with the face downwards, support his chest by folded articles of clothing, and place one arm under the forehead.

19. Whilst the patient is in this position, make uniform but efficient pressure by means of the

hand on the back, between or on the shoulder-blades, so as to press the air out of the lungs.

20. Turn the body carefully on the side and a little beyond, and then briskly on the face back again.

21. These measures should be repeated fifteen times in a minute (counting slowly up to four each time), first to the one side and then to the other, one of the assistants meanwhile supporting the head and arms. By placing the patient on the chest the weight of the body forces out the air; when replaced on his back, the chest expands and air is drawn in.

As soon as a spontaneous effort to breathe is produced by either of these measures, leave them off and endeavour to restore the circulation and warmth.

22. Wrap the body in dry blankets and commence rubbing the limbs upwards firmly and energetically under the blanket or over warm articles of clothing, which can generally be procured from the bystanders.

23. The patient should then, if possible, be put into a warm bed, and covered over with hot flannels. Bottles or bladders of hot water, or heated bricks,

should be applied to the pit of the stomach, in the armpits, between the thighs, and to the soles of the feet.

24. When life has been so far restored that the patient is able to swallow, give him warm fluids by spoonfuls to drink—warm water, tea, coffee, brandy and water, wine—but not in too great quantities. Warm baths should only be used when ordered by the doctor.

SUFFOCATION.

Suffocation is principally caused by inhaling noxious gases, viz. charcoal vapour; coal-gas (the escape of which is due either to faulty pipes or to its not having been turned off); sewer gas (which proceeds from cesspools, soil-pipes, and disused wells); carbonic acid (which is contained in over-crowded rooms, and cellars in which new wine or beer has been placed).

Persons who are in places containing such noxious gases soon become stupefied, the breathing becomes impaired, the pulse stops, they lose consciousness, faint, become convulsed, and die if not speedily rescued.

The first thing to be done in such cases is to

bring the unconscious person at once into the fresh air.

But in doing this the person who has gone to the rescue must act with the greatest caution, lest he himself should fall a victim to the noxious atmosphere.

Before going into a room filled with charcoal vapour, one must first try to establish a through draught by opening the doors, and forcing in the windows, if possible from the outside (by means of poles and ladders). Should this latter be impossible, the best plan is to cover one's mouth and nose over with a cloth soaked in water, or equal parts of vinegar and water, take a deep breath at the door of the room, rush to the nearest window in it, break a pane, put the head through the aperture, take in fresh breath, rush to the next window, and so on till the through draught has dispersed the vapour, and the unconscious person can be removed.

If gas has escaped into a room, one must of course not enter it with a light, but endeavour to find the window in the dark.

When a man who has gone down into a pit becomes unconscious, it is a proof of the dangerous

state of the air in it. (The experiment, so much recommended, of first lowering a lighted candle into such air, is not thoroughly to be relied on, for a light continues to burn in sulphuretted hydrogen.) The best thing to do is to send instantly for ladders and ropes, protect the mouth and nose by means of a cloth dipped in vinegar and water, and endeavour to get rid of the poisonous gas (which is generally heavier than the natural air) by creating a movement and disturbance in it. This may be done by discharging a gun, by throwing down burning straw or paper, by lowering an open umbrella and quickly drawing it up again, and by throwing down quantities of water or lime-water. As sewer gases are sometimes inflammable and explosive, one must be very careful, when throwing burning substances into them, not to get burnt by the sudden bursting forth of flames.

Whoever goes down into a pit to rescue an unconscious person should have a cord fastened firmly round his chest and shoulders, and a signal line attached to one hand. A cloth soaked in vinegar and water should be bound over his mouth. The rope is held tightly stretched from

above, while the signal cord is watched by a person specially deputed for that purpose. Should the person who goes down into the pit cease to answer the periodic call from those above, and no longer use the signal cord, he has probably become faint and should at once be drawn up.

When he has safely reached the bottom of the pit, he endeavours to find the unconscious person with as little delay as possible, fastens a second cord (which has also been lowered) round him, and then gives the signal to draw them both up.

As soon as the suffocated person is brought into the fresh air measures to restore life should at once be resorted to: artificial respiration, pouring cold water on him, and using stimulants in the manner already described.

On finding a person who has committed suicide by hanging, we should at once with one hand cut the cord by which he is suspended, while with the other we support the body, so that it may not be injured by falling to the ground. Then the same means of restoration must be used as in ordinary cases of suffocation.

Choking caused by pieces of food—meat, bones,

&c.—sticking in the throat and closing up the windpipe, may cause death very quickly.

In such circumstances the sufferer gets purple in the face, the eyes protrude, he makes inarticulate sounds, throws his arms about or seizes hold of his throat, and falls unconscious to the ground. In these cases one must act promptly, take hold of the nose with the left hand and keep the mouth open; boldly and quickly insert the first finger and thumb of the right hand over the tongue deep down into the mouth, and endeavour to catch hold of the obstruction and remove it from the throat.

If this does not succeed, try to loosen and force it out by pressing the chest and stomach of the person against a table, cupboard, or other solid piece of furniture, and give him with the fist several quick, smart blows on the back between the shoulder-blades. The air which is by these means pressed out of the lungs may force the obstruction out of the throat.

Send at once for the doctor, letting him know what is the matter, so that he may bring the necessary instruments with him—forceps, and those required for performing tracheotomy.

LOSS OF CONSCIOUSNESS.

Loss of sensation and of voluntary motion may result from other and very different conditions than those already described. The chief causes of loss of consciousness are:

1. Injuries to the brain, with or without fractures of the skull.

2. Diseases of the brain, apoplexy, epilepsy, &c.

3. Poisoning by narcotics, opium, morphia, alcohol, ether, and chloroform; and by uræmic poisoning, the result of kidney disease.

4. Fainting, paralysis of the heart through fright, pain, exhaustion, loss of blood, &c.

As it is often very difficult for the best medical man to determine at once with what form of unconsciousness he has to deal, it would be useless for me to tell you how to distinguish between and recognise these conditions. I will therefore confine myself to giving a few leading rules for the guidance of a non-professional person till medical aid arrives.

1. Obtain all information possible as to the cause of the accident, whether the injured person has had a fall or blow, been wounded, or has been drinking.

2. Note the position of the body and its surroundings, as the case might possibly be brought before a magistrate and a minute account of it be required.

3. Observe whether the breath smells of spirits. If this be the case, it shows that he has been drinking. But too much importance is not to be attached to this; as other and more serious conditions—paralysis, injury to the brain, &c.—may co-exist with intoxication. Moreover, the smell of spirits does not necessarily indicate intoxication.

4. Remove all tight clothing from about the neck—necktie, collar, shirt-studs, &c.—as these interfere with the flow of blood from the head.

5. Give free access to fresh air round the patient, and send all useless bystanders away.

6. Place the body on the back, with the head low if the face is pale, as in faintness after great loss of blood. If the face, however, is red, the head must be raised. If sickness sets in, the head should at once be turned on one side, so that the vomited matters be not drawn into the lungs.

7. If the patient has an epileptic fit, his body and limbs are convulsed, the face is red and dis-

torted, he foams at the mouth, and the tongue is often caught between the teeth. In such circumstances do not try to stop the convulsive movements or to open the clenched hands, for this would only increase the convulsions.

Endeavour only to prevent the patient injuring himself, place something soft under his head, and put something soft, such as a cork or pocket-handkerchief, between the teeth, so as to prevent the tongue being bitten, and wait quietly till the attack is over.

8. If the patient no longer breathes, which can be ascertained by holding a looking-glass or flat piece of metal or a feather before the mouth and nose, then we should at once have recourse to artificial respiration.

9. Send as quickly as possible for medical aid, or transport the patient to the hospital.

HEAT APOPLEXY

is a very dangerous form of unconsciousness produced by excessive heat during great bodily exertion, especially when drinking-water in sufficient quantities cannot be obtained.

Soldiers are most often struck down by it when marching on an oppressively hot day. The premonitory symptoms of this affection are a tormenting thirst, great lassitude, giddiness, difficulty of breathing. The skin is dry, the face red, the tongue parched; the pulse is small and rapid, and the respiration difficult. The patient on being spoken to either gives no answer, or, if he does answer, the replies are slow, hesitating, and uttered in a hoarse voice. Both the hearing and the movement of the tongue are affected.

If these symptoms are at once attended to, it is possible with care to avert the attack—*i.e.* by rest, loosening the clothes, quenching the thirst with water. If, on the contrary, the symptoms remain unnoticed, the person so affected suddenly falls down unconscious, the face becomes purple, the eyes glazed and staring: the respiration is very rapid, shallow, and at times stertorous. The pulse is very quick and almost imperceptible, and the skin dry and burning. If at this stage proper assistance is not rendered, the patient is seized with convulsive movements of both face and limbs. The body soon becomes rigid, the face blue, the pupils of the eyes distended,

the pulse weaker and weaker, the respiration rattling, and bloody froth issues from the mouth; death soon follows from paralysis of the heart and lungs.

This catastrophe can only be averted by prompt and proper aid. It is of paramount importance to reduce the temperature of the body as rapidly as possible and to administer fluids. The patient should if possible be transported at once to some cool and shady place, the clothes loosened, and the patient laid down with the upper part of the body somewhat raised. He should be fanned, sponged with cold water, or if this cannot be done, water be poured over him. Cloths wrung out in cold water should be laid on his head, and plenty of water be given him to drink. If the breathing should cease, then artificial respiration must be resorted to, the feet and hands be rubbed, and, as a last means, stimulants be used.

POISONING.

Poisons are substances which, taken internally, destroy life.

They are divided into irritants and narcotics.

1. Examples of irritants we have in arsenic,

phosphorus ; acids, such as sulphuric, nitric, and carbonic ; and alkalis, such as soda, lime, caustic potash.

These at once cause violent pain in the stomach and bowels, and sickness.

Acids and alkalis also burn the lips and inside of the mouth.

2. Examples of narcotics we have in opium, morphia, belladonna, hemlock, foxglove, tobacco, alcohol, prussic acid, strychnine. These cause torpor, delirium, insensibility, stertorous breathing.

Treatment of Poisoning.

Endeavour if possible to discover the nature of the poison ; send at once to the doctor and to the nearest chemist, where antidotes are to be procured.

Till help comes, remember that acids and alkalis act as antidotes to and neutralise each other ; therefore, if an irritant acid has been swallowed, alkalis dissolved in much water should at once be given, viz. soda, potash, magnesia, lime-water.

If an alkali has been taken, then give acids, viz. vinegar, lemon juice, &c.

To protect the stomach and gullet from the corrosive action of irritant poisons, bland and oily fluids, such as oil, white of egg, milk, flour and water, should be freely administered. To get rid of the poison in the stomach, try to cause vomiting by tickling the back of the throat with the finger or a feather; by giving large draughts of tepid water with a teaspoonful of salt or mustard; by emetics, if they are at hand, such as ipecacuanha and sulphate of zinc. If the poison taken be a vegetable narcotic, endeavour to keep the patient awake; give him strong black coffee to drink (or injections of strong coffee); put icy cold compresses on the head, and mustard plaisters on the stomach and calves of the legs; give douches of cold water.[1]

[1] The best antidote in poisoning by arsenic is the moist peroxide of iron of the *British Pharmacopœia*; it may be got from any chemist.

It can be improvised by dissolving half an ounce of sulphate of iron and half an ounce of carbonate of potash (or three-quarters of an ounce of carbonate of soda) separately in a cup of hot water, and mixing the solutions together. If it be at hand, a quarter of an ounce of calcined magnesia may be added. Dilute the soft pasty mixture with half a pint of hot water, and let it be taken as warm as possible.

In phosphorus poisoning give ten drops of oil of turpentine every quarter of an hour, in gruel or milk, with a little magnesia.

The doctor will endeavour by means of the stomach-pump to get rid of the poison.

Get, if you can, a piece of guttapercha tubing an inch in circumference, and if the patient is not unconscious, make him swallow twenty to twenty-five inches of it, enough to reach the stomach ; raise the free end above his head, and by means of a

FIG. 19.

FIG. 20.

funnel, pour as much water down as the stomach will receive (fig. 19), then lower the free end below the level of the stomach, and the stomach will empty itself (fig. 20). Repeat this process several times.

[If the patient cannot swallow, it requires medical skill to pass the tube into the stomach, avoiding the opening into the windpipe.]

LECTURE V.

TRANSPORT.

WHEN an accident occurs—be it in the country, on the high road, or in a town—the first thing to be done is to transport the injured person as quickly and as carefully as possible to a doctor or to a hospital, for on the proper transport of the patient his life and health oftentimes depend.

The importance of this task is naturally greatly increased in time of war, when large numbers of wounded have to be conveyed from the field of battle, both to the places where the bandaging and dressing are performed, and to the hospital.

In such circumstances stretchers or litters should, if possible, be used.

These are simply light portable beds made of a framework of poles, with a piece of canvas stretched between them. For the transport to hospital of ordinary cases of accident covered stretchers are

used, which are either carried by bearers by means of poles passing along each side or are supported on a light two-wheeled framework.

In time of war each army division is supplied with several bearers, who are provided with simple light stretchers, and who have been instructed by the surgeons how to transport the wounded after they have undergone a temporary dressing.

In very great battles, however, the means provided are insufficient, and the wounded are often obliged to lie for days and nights on the battlefield; volunteer helpers are then much in request, and can be of the greatest use.

It was the thrilling description given by Henry Dunant of the battlefield of Solferino that led to the formation of the Red Cross Society, a society which has done wonderful service in recent wars.

Among the results of the philanthropic works of the Red Cross Society is the introduction of litters on wheels, first used in 1864 at Düppel by the Knights of St. John of Jerusalem.

A particularly useful one (figs. 21 and 22) has been invented by Sir John Furley, one of the original organisers of the St. John Ambulance Association in England, who has done so much for

ambulance work in England, and who has personally most actively represented the Red Cross Society on most of the battle-fields of recent wars.

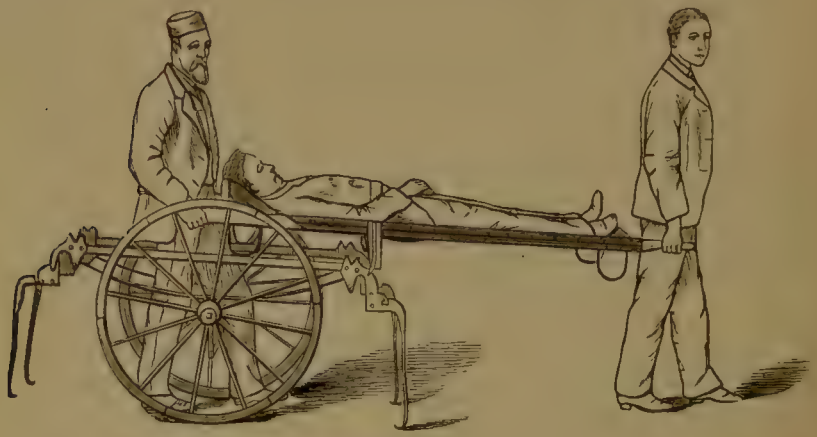

FIG. 21.

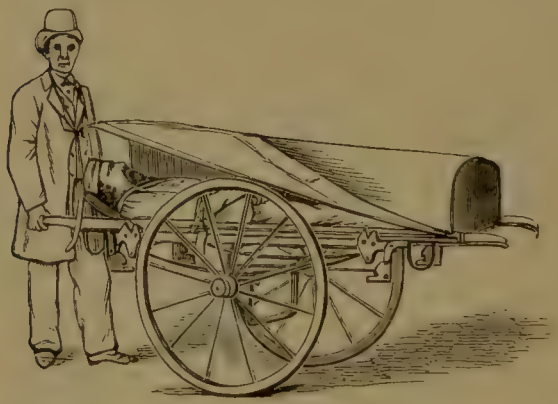

FIG. 22.

These wheeled litters are of service in time of war, if the ground is not too unfavourable; but

they are more useful in cases of accident in every-day life, particularly in large towns, as they may be stationed at appointed places (such as railway stations, police stations, fire-brigade stations), from which they may be easily and rapidly fetched by one person. On flat ground they are the easiest means of transport for the patient. Better still of course are the fully equipped horse-ambulances, fitted with a comfortable stretcher.

To place an injured person on a stretcher and convey him properly requires a certain amount of handiness—which is, however, easily acquired by a little practice. Only three bearers are required, unless the distance be very great; two of them carry the stretcher, and the third attends to the patient and changes place with one of the bearers if necessary.

To place the patient on it, put the foot of the stretcher at his head in a line with his body. If you put it at the side of the patient, it is in the way of the bearers and they may stumble or fall over it.

The two bearers then place themselves one at either side, join hands underneath the back and hips of the patient, raise him up, lift him back-

wards over the stretcher, and lower him on to it.

The third bearer takes charge of the injured portion (limb or head), and steadies it with a hand on either side.

The two bearers now take their places at the head and foot of the stretcher, lift it up, and carry it off; while the third walks at the side of it, as a safeguard to the patient.

The following rules should be observed in carrying a stretcher:—

1. It should be carried with the hands, or suspended by straps over the bearers' shoulders.

The stretcher should never be placed on the shoulders, because the bearer cannot then watch the patient, who might fall off before he could be prevented, or even die without the bearer observing it.

2. The bearers should not keep step. If they keep pace, as in marching, the stretcher sways from side to side, and the patient is apt to roll. To prevent this the bearers must walk in broken step—*i.e.* not put the same foot forward. Then the motion of the stretcher remains even.

The pace must be short (about 20 inches), and

without a spring ; the knees must be rather bent, and the hips moved as little as possible.[1]

3. All jolting, hurried movements, the crossing of fences, ditches, &c., are to be avoided. Look out for gaps, gates, and doors, and make use of them.

4. If possible, choose bearers of the same height. If this cannot be done, arrange the shoulder-straps in such a way that the stretcher may be balanced as evenly as possible.

5. In ascending, the patient's head must be in front ; in descending, behind, except in the case of a broken leg, when, if such a course were adopted, the weight of the body would press on the injured part. This applies particularly in cases of fractured thigh, which are most difficult to transport without causing pain to the patient : the best manner of avoiding giving suffering is to place a big bolster underneath his knees so that the patient is really virtually suspended by his knees. One can also quickly make a double inclined plane with two planks—or use a chair the back legs of which have been sawn short. An especially useful and practical device is Port's thigh stretcher,

[1] The Italian boys, with their trays of plaster-of-Paris figures, always walk in this manner.

which is easily constructed out of two long poles connected together by three cross-pieces, one at the head, another at the feet, and a third passing under the patient's knees. A piece of stout canvas or other material is fixed to the head and foot pieces in the manner of the ordinary deck chair. On this the patient can rest comfortably and be carried even long distances without pain.

It is also very useful and practical to use a stretcher made out of two long poles and two short ones at the head, with two bars through these at the top and bottom—all firmly nailed together. The sufferer can be most comfortably and safely transported thus.

6. The patient must be removed from the stretcher in the same manner in which he was placed on it.

The military ambulance bearers are trained to carry out all these movements by fixed words of command; in this way the movements gain markedly in precision and quickness.

Should no stretcher be at hand, one must be improvised—*i.e.* you must look about for a substitute, or put together a variety of things on which

the injured person can be transported without further harm. In constructing such temporary stretchers, each person must exercise his ingenuity as in extemporising splints. Some people will quickly put a stretcher together out of anything at hand, whilst others are entirely at a loss what to do.

I will just mention a few examples of such temporary stretchers.

Amongst the articles to be found in inhabited houses which can be used for such are bedsteads, bedframes, sofas, window-shutters, boards, benches, chairs, &c. Such hard materials should be covered by pillows, blankets, straw, &c.; mattresses, or sacks of straw, having rings or loops made with straps attached to their four corners, may also be used as stretchers.

Counterpanes, blankets, rugs of all kinds, may be carried by the four corners by four men; or may have two poles sewn to their sides, and be carried by two men. Empty corn or flour sacks may be used for the same purpose.[1]

[1] General Jackson, during the war against the American Indians, had his wounded carried on the skins of the slaughtered oxen slung between muskets.

Hammocks fastened to one or two poles and carried on the shoulders of two men, are much used in the Navy.

With two poles a variety of different materials can be used for making useful stretchers. Failing these, muskets or lance-staffs lying about on the battlefield can be used in time of war. These pushed through the coat-sleeves (turned inside out) of two tunics or military cloaks buttoned across them, form a stretcher ; folded-up cloaks can also be used.

Sailors can use their oars, boat-hooks, jackets, and jerseys in the same manner and for the same purpose.

Two or three knapsacks fastened between two poles or muskets by their straps, also form a stretcher.

Girths and straps of all descriptions—belts, saddle-girths, knapsack-straps, musket-straps, bridles, stirrup-straps, such as are found on battlefields, also rope, cords, and hoses (fire brigade) stretched across two poles like a net, may also be used for this purpose.

A long rope of straw, which the country people are accustomed to plait very rapidly, may also be

used. These ropes are plaited with three bundles of smooth straw like a 'three plait,' which are twisted before each turn. Laid zigzag over two poles kept apart by two cross-pieces of wood, having a straw pillow placed on them, they form a very comfortable straw stretcher.

Fascines and gabions, such as are used in trenches, can be turned into stretchers.

From woods and gardens you can take branches and young spruce stems, and, binding them together with birch twigs, make excellent temporary stretchers with supports, after the design of the Norwegian surgeon Dr. Christen Smith, who first exhibited one of them at the Exhibition of Hygiene at Brussels in 1874. He covered these stretchers with a three-corner canvas cloth which all Norwegian soldiers carry on their knapsacks.

If neither a stretcher nor material out of which to make one can be found, then try to transport the wounded man with your arms, which naturally can only be done for a short distance.

If there is only one person at hand to help, and if the wounded man can walk, though weak from hæmorrhage and faintness, then he must put one arm round the neck of the person assisting

him, so that his hand hangs down over the further shoulder ; the person assisting places his arm from behind round the waist of the wounded man, and with his other hand holds that of the patient hanging over his shoulder (fig. 23). In this way he can support him very efficiently, and if necessary raise him from the ground and help him on. Should the patient, however, be unable to stand or walk, then the person helping him can take him either on his back, or, if strong enough, carry him in his arms like a child. In either case the wounded man must place his arms round the neck of the man carrying him.

FIG. 23.

Should there be two people at hand to render assistance, the wounded man may be transported in a variety of ways, viz. :—

1. Sitting on the hands of the bearers, who

pass two hands under the thighs and two behind the loins, the patient putting his arms round the necks of those carrying him (fig. 25).

2. The persons transporting a wounded man join their hands firmly together, forming a sort of

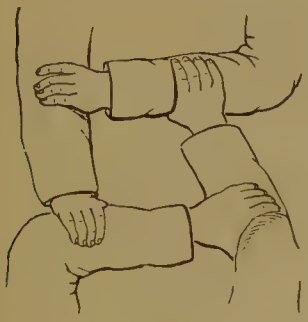

Fig. 24.

Fig. 26.

Fig. 25.

sedan chair [1] (fig. 24), on which they can carry him a long distance if he places his arms round their necks.

3. Their task may be made easier if, by means of a belt, a knotted rope, or a straw rope, they make a round seat on which the wounded person is placed, and which is held on either side with one hand by the bearers (fig. 26).

[1] English children call this a 'bandy chair.'

Stretchers made with muskets and knapsacks can also be carried by two bearers if the wounded man places his arms round their shoulders or rests his back against the chest of the hindmost bearer.

FIG. 27

If the patient be unconscious, one of the bearers must support the upper part of the body, and the other, walking in front, take the legs, one under each arm (fig. 27).

If an injured person has to be transported to so great a distance that the assistance of many

bearers for the stretchers would be necessary, a carriage should be procured, if possible, and the stretcher carefully placed on it, and fastened securely with ropes to the interior.

The Army Ambulance Corps is regularly instructed how to fit up an ordinary waggon for the transport of the wounded, by means of straw ropes, &c.

In cases of exigency these waggons are filled with straw, hay, fern, or other soft substances, on which the patient is carefully laid.

A very ingenious method has been devised by Dr. Christen Smith for adding wooden springs to these waggons for the transport of the wounded

In winter, when there is snow on the ground, sledges are naturally a much better mode of transport for the wounded than waggons, as they glide smoothly over the snow without any jar.

For the same reason transport by water, in boats, ships, or on rafts, is much to be preferred to transport by road.

If you cannot procure a carriage or waggon, but can only get a horse, mule, or other animal used for drawing weights, then, by means of a long pair of poles or small trees, a sledge can be

constructed on which the wounded may be transported in a comparatively easy manner, even on rough ground.

Such sledges are much used in mountainous districts, and are also used in the plains for transporting heavy weights, such as rock, &c.

During an expedition which I once made with a party on Monte Generoso, between Lugano and Como, one of the ladies had the misfortune to fall with the mule on which she was riding, and to sprain her foot badly. We carried her to a small Italian village and endeavoured to procure a stretcher and a carriage. This latter was not to be had, the roads being much too steep and uneven for the passage of such a vehicle. The inhabitants offered us a mountain sledge composed of two long tree stems, the one end of which was borne and drawn by two cows, whilst the other end dragged on the ground. On this a large basket-bed was fastened, well stuffed with bedding, and which held comfortably four of the ladies.

With this conveyance we slowly descended to the shores of the Lake of Como, and though the road was in places really terrible, the drive was a very comfortable one for the ladies, and our patient

suffered no pain, owing to the easy motion of the sledge. I was vividly reminded of this adventure during the Russo-Turkish war. When a Russian lady of high birth asked me whether I could not recommend a means of conveyance for the many wounded, who suffered terribly on the bad roads when transported in the waggons provided with square-edged wheels, I recommended her to try such sledges, and heard afterwards that the result had proved highly satisfactory.

I have since been told that in North America Indian tribes use such sledges in their wanderings through the prairies to transport their wives, children, and wounded.

If a wounded person has to be transported by rail, try to place the stretcher—if he be on one—in a compartment. Much help is required for this purpose, particularly if the platform be not high. It is best to place the stretcher lengthways across two seats. If there is no stretcher, make a couch by means of a board laid between the seats. If the stretcher is too broad to pass through the door of a compartment, then place it in a luggage van.

As the springs of these vans are very rough and

stiff, and only begin to act when heavily laden, the stretcher should have, between it and the floor, a layer of straw or other springy substance.

The litters on wheels are provided with excellent springs, and are therefore well adapted for transport in luggage vans.

The best means of transport by rail are ambulance carriages made for that purpose, and saloon carriages. This means is, alas! very expensive. Years ago I pointed out that it would be most desirable that the Red Cross Society should have such carriages in readiness, so as to be able to use them whenever required. Hitherto my recommendation has found no response.

In times of war the railroad is very much used for the transport of the sick and wounded; and in the last great war the example of the Americans was followed, and hospital trains, containing everything requisite for the sick and wounded, were provided.

For our own army the plan I proposed in 1867 for utilising the fourth-class railway carriages on the American principle has been adopted and is well organised. Luggage vans, in which the stretchers are suspended by ropes, are also used.

It is one of the first duties of the Red Cross Society to fit up such hospital trains in time of war, so as to transport the sick and wounded direct from the battlefield to the hospitals at home.

AMBULANCE PRACTICE.

After each lecture the following first-aid methods should be practised by the pupils of an ambulance class.

1. Methods of applying the three-cornered bandage.

FIG. 28.—Reef Knot.

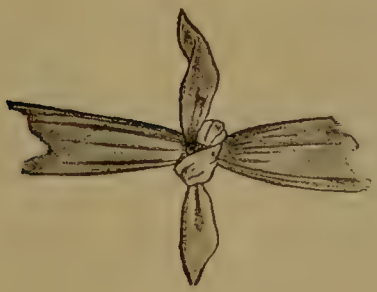

FIG. 29.—'Granny Knot.

The reef knot should always be used, not the 'granny.'

(*a*) Dressings made with the folded bandage. Figs. 30 to 36*b*.

FIG. 30.—Neck Bandage.

FIG. 31.—Neck Bandage with Cardboard Support.

FIG. 32.—Eye Bandage

FIG. 33.—Chin Sling.

FIG. 34.—Figure of Eight bandage for the Hand.

FIG. 35.—Knee Bandage.

FIG. 36 *a*.—Head Bandage.

FIG. 36 *b*.—Head Bandage.

(*b*) Dressings made with the bandage opened out. Figs. 37 to 44*b*.

FIG. 37.—Head Sling.

FIG. 38.—Head Sling.

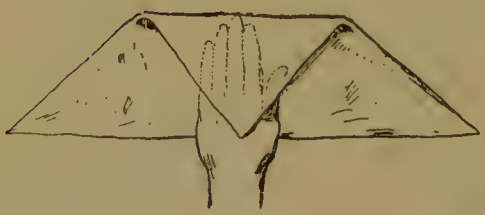

FIG. 39 *a*.

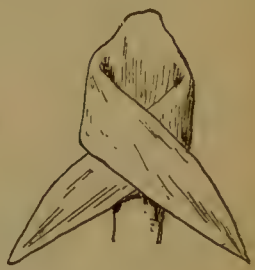

FIG. 39 *b*.

Application of Hand Bandage.

FIG. 40.—Foot Bandage.

FIG. 41.—Hip Bandage.

FIG. 42.—Shoulder, Hand and Elbow Bandage, and Narrow Sling.

FIG. 43.—Head, Breast and Shoulder Bandage.

FIG. 44 *a*.—Arm Sling.

FIG. 44 *b*.—Arm Sling.

In cases of necessity a sling for a damaged arm may be improvised out of the sleeve or front of the patient's coat.

FIG. 45

FIG. 46.

2. The manner in which to arrest hæmorrhage by pressure on the arteries, either with the thumb or tourniquet or elastic bandage.

3. The proper adjustment of splints (made from pasteboard, wires round flower-pots, boards, &c., &c.)

4. Sylvester's method of artificial respiration.

5. The transport of the injured.

LECTURE VI.

NURSING.

It scarcely requires mentioning that nursing is the sequel to the first aid rendered to the sick and wounded.

When anyone near or dear to us is struck down by sickness or accident, it is but natural that we should not only wish to render what service we can at the moment, until professional help be obtained, but should also deem it a privilege and satisfaction to carry out afterwards with skill and understanding the orders and directions given by the doctor. These observations are specially directed to the ladies among the audience; for nursing has ever been woman's special province; she has always stood foremost as an example of self-abnegation and self-devotion.

Alike in times of war as in peace, nursing as

a vocation has been women's work, and through it the blessings they have effected have been untold.

Although this lecture is on the subject of nursing, it is by no means my intention to try and make nurses of you; for, to become that, years of training, of daily practice and hard work, are necessary. I would only wish to make it possible for you in case of sickness in your families, either at the bedside of a sick child or husband, to be able to carry out properly the orders left by the doctor, and to call your attention to many things often apparently insignificant, which are of paramount importance to the patient.

Many of the things I shall tell you are doubtless familiar to you, because they are part of the many duties of a good mother of a family and head of a house. Nevertheless, I feel bound to mention them, as superstition and old women's tales still tend to get the upper hand of scientific knowledge of health.

We will begin with the sick-room, its arrangement, &c.

Sick-room.

What do we expect a sick-room to be?

Generally speaking, a bright and cheerful living room; for the patient has to spend sometimes many weary weeks and months in it. Above all things it should not be too small, but if possible high and airy. The windows must open easily, and it is advisable they should have a sunny aspect, for human beings, like plants, prosper most with sunlight.

Some diseases require a darkened room, but the right amount should be obtained by blinds and curtains. At night a candle or night-light should be used.

It is very important that absolute quiet should prevail in the sick-room; particularly in cases of fever and nervous disorders. It is not always possible to have the sick-room looking out on a garden, or far from the noise of a street; but in the room itself we can avoid loud and unnecessary talking, noisy movements, &c. On the other hand, whispering in the sick-room is a very grave mistake.

I would also caution my hearers that any

visitor in winter should not be allowed to go straight from the cold air to the patient. Always bear in mind that whilst nursing, the *only* way to clean the room and its furniture is to wipe all with a damp cloth, paying special attention to the corners where dust may collect. All so-called 'dust traps' should be banished from the sick-room, by which I mean unnecessary curtains, plush-covered furniture, &c. I recommend simple furniture, and, to brighten the room, flowers with no strong scent, and growing plants in the window.

Pure air and good ventilation are often of greater use than medicine. It is perhaps not generally realised that the air is exhausted by breathing, and not only that, but by lamps and candles. One lamp consumes as much oxygen as four people. The effluvia from ointments, poultices, discharges from wounds or abscesses, and even the smell of food, pollute the atmosphere of the room, and can only be obviated by thorough ventilation.

Where there are no regular ventilators the air must be changed by opening the windows and doors; the so much dreaded draught will not harm the patient if he is properly covered up.

As the cold air sinks and the hot air rises, the proper mode of ventilation is to open the upper part of the window, which lets out the impure heated air, so that the entering cool air may mingle gradually with the warm atmosphere of the room before reaching the sick person.

The temperature of the sick-room must never be too high ; it had better be too cool than the reverse. As a general rule the temperature should be about 60° Fahrenheit, which is the right temperature for those who are well as for those who are ill ; but there are certain diseases, such as lung affections, violent hæmorrhage, anæmia, &c., which need greater warmth, as the patient easily becomes chilly. It is also of great importance to keep the air moist, as dry heat is most injurious to patients with chest complaints.

Let me now turn your attention to the patient himself and his bed.

The Sick-bed

should be placed in such a position that the nurse can have access to her patient from both sides ; it should be placed in such a manner that the patient has the light behind him. An iron bedstead with

a woven-wire spring mattress is by far the best ; it is light and very easily cleaned. A thin horsehair mattress above the spring one is the proper thing for use ; it is clean, cool, and yielding. The feather bed must be discarded, and flock woollen mattresses should be strictly avoided.

The sheets may be either of linen or cotton ; the blankets light, either white or of some light colour, so that the slightest speck of dirt may be at once perceptible. It is of great importance in making the bed that the under sheet (as well as the under blanket, if one is used) should be drawn quite tightly over the mattress and well tucked in both at the top and the bottom, in order to prevent any creases or ridges or rucks in the under bedclothes.

Such small troubles are often productive of much discomfort to the patient, and also tend to produce bed-sores by pressing unequally on his back. This is particularly the case where the patient is confined for a long time to his bed.

The following rules should be observed in changing the sheets :—

'After loosening the bedclothes all round, place the clean sheet rolled up at the foot of the bed

beneath the soiled sheet, and then, assisted by another person on the opposite side, unroll and carry up to the top of the bed the clean sheet, which in this way is placed in its proper position next the patient; the bedclothes, including the soiled sheet, are then removed, the latter put aside, and the blankets, &c., replaced.

'To change the lower sheet, after having loosened the bedclothes, roll the sheet crosswise at the top of the bed, and, raising the patient's head and shoulders carefully, at the same time removing the pillow and bolster out of your way, continue rolling the soiled sheet down the bed till the roll is against the patient's back; then place at the head of the bed the clean sheet rolled up crosswise, and quickly unroll it down the bed until its roll touches the soiled roll. The shoulders and head of the patient are then laid down, the pillow and bolster having been replaced, the hips are gently raised, and the rolling downwards of the soiled sheet and the unrolling of the clean sheet are continued until, in turn, the feet are reached, raised, and the soiled sheet is altogether replaced by the clean one.'[1]

[1] R. Lawson Roberts, M.D., 'Nursing and Hygiene.'

In the case of the

Nursing of the patient himself

the most scrupulous cleanliness is to be observed. The person or nurse should make it an absolute rule to see that her patient's face, neck, arms, and hands are washed every morning, the feet and legs every other day if feasible, but certainly once a week. Should any part of the patient's body become unexpectedly soiled, it should at once be washed and thoroughly dried. In prolonged cases of illness, the back should be examined daily, and washed with a solution of spirits of wine, and, after having been carefully dried, should be dusted over with flour starch or powdered with oxide of zinc.

The body linen should be changed at least once a week, and, if possible, oftener.

In changing it, it is generally well to begin by slipping out the arms of the patient from his night-dress, then pass the fresh one over his head, pulling it down over him and bringing the soiled one off by the feet. If, however, the sick person be unable to help himself, it is best then to have the night-dress cut up the front, to be tied together with tapes. Begin by taking one arm out, and put the sleeve

of the fresh dress on at once ; then gently push the soiled one off under the shoulders, and pass the clean one in the same direction after it ; pull off the other sleeve, and finish putting on the second clean one. If a flannel vest be worn underneath, it must be cut up the front and treated in the same manner.

No slop-pails are ever to be brought into the sick-room, and the bed-pans and such-like utensils should only be brought in when required, and immediately after use they should be removed, emptied, and cleaned with soda and warm water. It is a good plan to put a little disinfectant in the bed-pans before and after use.

There are many points on which an intelligent nurse can render most essential service to the doctor by careful observation of her charge, for she has a better opportunity of doing this than he has.

In taking a record of the patient's temperature, the pulse and respiration should be observed at the same time, and an accurate record kept of them on a 'chart,' which should be shown to the medical attendant at each of his visits. The same thermometer (clinical) should always be used for the

same patient, and it should be kept in the axilla a stated time; three minutes is the shortest time, and ten minutes the longest, but five minutes is practically sufficient; the number of minutes should never be varied. There are certain points to be kept in mind, *i.e.* That the average normal temperature is 98·4°. That the best times for taking the temperature are between seven and nine o'clock A.M., at noon, between five and seven P.M., and again at midnight. Temperatures taken in the mouth or rectum are one degree higher than those taken in the armpits and folds of the groin. After the temperature has been taken, the index of the thermometer requires to be gently shaken back. In the same manner the nurse should keep a minute record of the frequency of the pulse and respiration for the information of the medical attendant.

Medicines should be given with great accuracy and regularity, according to the doctor's directions.

In concluding these very brief remarks, it is to be remembered that the manner in which food is given to a sick person has a great effect on the manner in which it is accepted. Always offer less rather than more of anything. It should be nicely

served, so as to tempt the patient. The nurse should scrupulously observe the doctor's directions with regard to food, the frequency with which the patient is to be fed, and whether he is to be awakened from sleep to take his nourishment. It is very useful to write down on a piece of paper how often, when, and what food is given. Great importance should be attached to the giving of stimulants—as to the quantity, times, and manner in which the doctor orders them to be administered.[1]

In concluding my course of Lectures, I thank you all for the attention with which you have listened to me, and for the sympathy you have shown for the object brought before you, at the same time expressing the hope that this work may spread and carry blessings all over Germany.

After each lecture, practical instruction was given in the following modes of rendering aid :—

1. The use of the three-cornered handkerchief.

[1] Some additions have been introduced by the translator, to make this last Lecture more complete.

a. Folded together as a neck-handkerchief, for the neck, eye, forehead, ear, cheek, chin, jaw; to fasten on compresses or antiseptic pads on wounds, and to fasten on splints. To support the arm (small sling).

b. Unfolded, in its triangular shape as a sling for the support of the arm.

Head handkerchief bandage.

Handkerchief bandage for chest and back.

Handkerchief bandage for the shoulder.

Handkerchief bandage for the hip.

Handkerchief bandage for the foot.

2. The manner in which to use roller bandages.

Bandaging from below upwards smoothly (without creases) with even pressure (avoiding gaping).

Turns in bandaging—the circular, the rapidly ascending spiral, the slowly ascending spiral (the turns of which partially overlap each other).

Bandaging by reverses (when the circumference of the limb increases).

Figure-of-eight bandage, employed where the bandage passes over a joint.

3. The fixing and fastening on of *splints* (pasteboard), in cases of fractures of limbs.

4. How to stop hæmorrhage by compressing the arteries with the fingers, by means of a tourniquet, of the elastic tubing or bandage, and by the 'Völkers' tourniquet.[1]

5. *Artificial respiration* in cases of apparent death (Sylvester's method).

6. The transport of the injured.

[1] Invention of Professor Völkers, of Kiel.

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